U.S. TREASURY DEPARTMENT - - - COAST GUARD

Bulletin No. 51

REPORT OF THE INTERNATIONAL ICE PATROL SERVICE IN THE NORTH ATLANTIC OCEAN - [SEASON of 1965]

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REPORT OF THE INTERNATIONAL ICE PATROL SERVICE

IN THE

NORTH ATLANTIC OCEAN

R. E. LENCZYK

CG-188-20

Season of 1965

U.S. GOVERNMENT PRINTING OFFICE
WASHINGTON : 1965

TREASURY DEPARTMENT
UNITED STATES COAST GUARD

1 August 1966

ADDRESS REPLY TO:
COMMANDANT (OMS)
U.S. COAST GUARD
WASHINGTON, D.C. 20226

Transmitted herewith is Bulletin No. 51, Report of the International Ice Patrol Service in the North Atlantic Ocean, season of 1965.

P E Trimble

P. E. TRIMBLE
Acting

Dist (SDL No. 83)
A: abdefghmuv(1)
B: a(250); e(5); beg(2); m(1)
C: abc(1)
D: s(35); h(10); ce(1)
E: None
F: None
SML 133

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PREFACE

This bulletin is No. 51 in the series of annual reports on the International Ice Observation and Ice Patrol Services. The authority for mission, forces assigned, and method of operation of the International Ice Patrol during the 1965 season are described.

Aerial ice observation and communication statistics are presented.

All ships reporting ice and weather to the International Ice Patrol in 1965 are tabulated. A month-by-month general description of ice conditions for the Grand Banks area is given. Only 76 bergs drifted south of latitude 48° N. during the season, a low figure in comparison with the 1900–1965 average of 377 bergs. The most southerly berg of the season was reported 28 May in 42°43′ N., 51°54′ W. The duration and maximum extension of the pack ice to the south and east of the Newfoundland coast was subnormal.

Preseason and postseason activities, including the 1964 postseason northern ice surveys previously reported in the Season of 1964 Bulletin, are tabulated.

Weather and the climatology of Baffin Bay, Davis Strait, and the Labrador Sea as related to ice conditions are presented.

Capt. Richard L. Fuller, U.S.C.G., was Commander, International Ice Patrol, as well as Commanding Officer, U.S.C.G. Air Station, Argentia, Newfoundland.

The author of this bulletin, Comdr. J. E. Murray, U.S.C.G., acknowledges meteorological data supplied by Mr. William E. Markham, head of the Canadian Department of Transport, Ice Central, Halifax, Nova Scotia, and by the U.S. Naval Oceanographic Office. Assisting in the preparation of the illustrations and manuscript were Senior Chief Aerographer's Mate Donald C. Bailey, Chief Aerographer's Mate William F. Van Gaasbeck, and Chief Yeoman Harris E. Nylen.

INTERNATIONAL ICE PATROL

The International Ice Patrol Service for 1965 was carried out by the U.S. Coast Guard in accordance with the provisions of the International Convention for the Safety of Life at Sea, 1960 and United States Code, Title 46, Sections 738–739d. The mission of protecting shipping from the dangers of ice drifting in the Grand Banks area was accomplished by the collection of ice information from all available sources and by means of twice daily radio broadcasts and daily facsimile broadcasts disseminating to shipping the description of the current ice situation. The scientific program dealing with the factors influencing the distribution and drift of ice in Baffin Bay, Labrador Sea and North Atlantic Ocean was continued.

The Commander, International Ice Patrol, Capt. R. L. Fuller, U.S.C.G., had the following facilities available to him during the ice season: a staff of 2 officers and 14 enlisted men; radio and landline communication facilities of Coast Guard Radio Station NIK; Hercules HC–130B reconnaissance aircraft support provided by the U.S. Coast Guard Air Station, Argentia, Newfoundland; two surface patrol cutters, U.S. Coast Guard Cutter *Tamaroa* and U.S. Coast Guard Cutter *Acushnet*, and an oceanographic survey vessel, U.S. Coast Guard Cutter *Evergreen*. The efficiency of the aerial ice reconnaissance and the distribution of ice made it unnecessary to utilize a surface patrol vessel for the sixth consecutive year. This was the second year the Commander, International Ice Patrol was permanently stationed at Argentia, Newfoundland, the hub for all ice reconnaissance activities for the ice patrol areas.

Preseason aerial ice reconnaissance indicated a light ice season and on 15 February indicated ice present on the Grand Banks. The first of 35 ice observation flights made during the season was flown on 9 March. Radio broadcast of the twice daily ice broadcasts to shipping was commenced at 1330 G.m.t., 1 March 1965. The radio broadcasts were also sent via landline to the U.S. Navy Oceanographic Office, the Canadian Department of Transport, R.C.N. Radio Station, Albro Lake N.S., and others for further dissemination.

The principal sources of ice information during the ice season were the ice observation flights made by International Ice Patrol aircraft, reports made by commercial and military vessels and aircraft, ice reconnaissance flights by the Canadian Department of Transport in the

Gulf of St. Lawrence and Newfoundland coastal waters, by the U.S. Navy in the Labrador Sea and Baffin Bay, and other contributors. Merchant marine ship reports on weather and ice conditions were an extremely important source of information.

The operations of the International Ice Patrol from 1 March to 6 June can be summarized as:

1. Thirty-five Ice Patrol reconnaissance flights were flown for the main purpose of guarding the southeastern, southern and southwestern limits of all ice on the Grand Banks.

2. Ice reports were collected from ships, aircraft, and other ice observation agencies.

3. Weather reports, including sea surface temperatures, were collected from ships.

4. Ice information was plotted and analyzed.

5. Ice conditions were forecast twice daily during periods between observed ice conditions.

6. Ice advisory broadcasts were made twice daily to shipping and transmitted twice daily to interested agencies.

7. Facsimile transmissions were made once daily to shipping.

8. Special ice information was provided on request.

9. Position plots were maintained of all reporting ships in the Ice Patrol area.

10. Three oceanographic cruises were conducted between 30 March and 25 May to collect oceanographic data affecting the drift and deterioration of ice.

USCGC *Evergreen* made the oceanographic surveys in the critical sectors of the Grand Banks area during the ice season and conducted studies into the drift and deterioration of bergs. By means of the current maps resulting from these surveys, semimonthly isotherm charts prepared from sea temperatures reported by shipping, and wind data supplied by the U.S. Fleet Weather Central at Argentia, estimates of the set, drift, and deterioration of bergs and field ice were made. With these data a current 12-hourly plot on ice conditions was maintained. These estimates were then used to plan ice reconnaissance flights and in issuing the radio broadcasts. They were particularly useful after extended periods of poor visibility when no ice observations could be made. For a detailed discussion of the oceanography of this area, refer to U.S. Coast Guard Oceanographic Report Series, CG-373.

Only 76 bergs drifted south of latitude 48° N. in the Grand Banks area during all of 1965, a low figure in comparison with the 1900–1965 average of 377 bergs. Only one of these bergs drifted into the United States-European North Atlantic Track Agreement tracks B and C. However, due to its small size it quickly melted and never posed any great threat to shipping.

The Canadian-European tracks E and F were free of field ice during the periods they were regularly scheduled to be in effect, but were encumbered by a few bergs through June. The field ice blocking track G was practically all gone and the Strait of Belle Isle opened to shipping by 15 June, but bergs persisted in the approaches to the Strait until mid-September. The steamer track from Cabot Strait to the St. Lawrence River ports was essentially free of ice by mid-April.

Dissemination of ice information by the International Ice Patrol ceased on 6 June. By that time there was no ice far enough south in the Labrador Current to survive the trip to the vicinity of the Tail of the Banks and endanger the major steamer tracks traversing the area. Periodic post-season ice reconnaissance flights were continued to guard against any stray berg reaching those tracks without warning to shipping. Northern ice reconnaissance surveys to the Hudson Straits were continued on a monthly basis. Berg census flights of western Baffin Bay were conducted in October and December.

The most significant of the many factors that contributed to the low berg count and which affected the drift and deterioration of bergs to the Grand Banks were: a heavier than normal concentration and thickness of the sea ice in western Melville Bay south of Cape York, Greenland in late summer of 1964; higher than normal air temperatures in Newfoundland and southern Labrador from late February to early March; and generally consistent onshore winds over the coastal waters of Labrador and northern Newfoundland in April and May and two periods of very strong southerly winds in early April.

The heavier than normal thickness of sea ice in Melville Bay, Greenland in September 1964 acted as a very effective barrier to bergs in their migration westward in the oceanic circulation of this area. The aerial berg census conducted 21–23 October 1964 observed over 2,400 bergs due south of Cape York, Greenland. These bergs were prevented from traveling their normal route and the berg supply for the forthcoming ice season was substantially reduced.

By late February field ice was to be found south to latitude 47° N. However, the warmer than normal air temperatures that existed from late February to 13 March, being well above freezing, rapidly deteriorated the field ice and it receded to north of latitude 48° N. with attendent deterioration of the bergs in the southern ice limits. Throughout April and May predominantly onshore winds tended to drift bergs from the offshore coastal waters into the heavily indented coastline of northern Newfoundland and Labrador. This effectively trapped many bergs in the numerous bays and islands studding the coast. The trapped bergs deteriorated in these locations. No consistently strong westerlies prevailed for any length of time to free these bergs and drift them into the Labrador Current. In early April

the field ice and bergs had reached approximately latitude 47° N. when strong southerly winds on 4–5 April drifted the ice north of latitude 48° N. By the 22d of April the ice had again drifted south of latitude 48° N. when again strong southerly winds completely deteriorated the field ice and, in combination with the eastern branch of the Labrador Current, produced a drift vector that moved the bergs, then poised to enter the steamer tracks, north of latitude 48°30′ N. and eastward out of the core of the Labrador Current.

Other than those already on the Grand Banks, only a few bergs could survive the transit to the Tail of the Banks. The seasonal pattern for 1965 had developed and completed its cycle by mid-May. No further serious threat to the Trans-Atlantic Lane Routes could develop. On 6 June the 1965 International Ice Patrol was terminated.

Table 1. Estimated number of icebergs south of 48° N., 1900–1965

Year	January	February	March	April	May	June	July	August	September	October	November	December	Annual
Total 1900–1945	118	447	2, 101	4, 811	7, 156	3, 486	1, 199	397	247	107	106	80	20, 255
Total 1946–64	10	86	542	1, 698	1, 197	808	200	8	1	2	4	5	4, 561
Total 1965	0	1	19	33	22	1	0	0	0	0	0	0	76
Averages 1946–65	0. 5	4. 4	28. 0	96. 6	61. 0	40. 4	10. 0	0. 4	0	0. 1	0. 2	0. 2	231. 8
Average	1. 9	8. 1	40. 3	99. 1	126. 8	65. 1	21. 2	6. 1	3. 8	1. 7	1. 7	1. 3	377

NOTES

1. Totals for 1946–65 are based mainly upon Ice Patrol aircraft reconnaissance with heavy reliance on visual sightings.
2. Totals for 1900–1945 are based mainly upon ship reports of other than Ice Patrol vessels.

AERIAL ICE RECONNAISSANCE

Thirty-five ice observation flights were made in two Lockheed Hercules (HC–130B) aircraft by the United States Coast Guard Air Station at Argentia during the ice season. These flights averaged 1,230 miles in length and 5.2 hours long. The longest flight was 1,840 miles in length. Included are three northern flights to Hudson Straits.

The primary objective of the aerial ice reconnaissance was to guard the southeastern, southern and southwestern limits of the ice-encumbered area in the vicinity of the Grand Banks so that shipping might be advised of the extent of that dangerous area. In addition, the aerial ice reconnaissance had the purpose of maintaining, insofar as visibility conditions and aircraft availability permitted, detailed up-to-date information of the ice situation in the Grand Banks region and north for the benefit of mariners traversing the ice area. Ice reports from shipping were of invaluable assistance in attaining these objectives.

The flight plans were usually made up of a system of parallel lines spaced at 20 or 25 mile intervals depending on visibility. This spacing was predicated on the ability of readily sighting bergs at 15 miles, hence, it provided a margin of overlap on parallel tracks and covered a sufficiently large search area. From past experience it appeared that

this search pattern was quite efficient for the purpose of detecting ice on days with good visibility. When poor visibility occurred, such that 15 mile visual sightings of bergs was precluded, this spacing appeared to be the optimum for a radar search and permitted sufficient reserve in flight hours to divert the aircraft from the pattern in order to identify radar targets. A trained aerial ice observer was assigned to each ice reconnaissance flight. Loran A was the primary positive method of air navigation. Airborne doppler sensor system was used to navigate all flight plans, and when possible, corrected by Loran A or other available means. The use of doppler radar visual readout presentations provided the ice observer continuous track and cross track information greatly assisting, and increasing the accuracy, in positioning bergs. Maneuvers off the prescribed tracks, once extremely difficult to plot, could now be readily plotted. Radar aided the observer in locating ice, especially when visibility conditions were minimal. A passive microwave radiometer, with the frequency selected for optimum ice emmissivity, is planned for installation for the 1966 ice season. It is hoped that this device will permit positive ice identification during periods of extremely poor visibility.

As in past years, the prevalence of fog in the Grand Banks area hampered the effectiveness and the systematic scheduling of ice reconnaissance flights. Weather reports from shipping and weather forecasts made by the United States Fleet Weather Central at Argentia were extremely helpful in avoiding the scheduling of flights during periods of low visibility in the search areas. When periods of low visibility continued for a number of days and it appeared, due to previous observed ice conditions, that a dangerous situation might develop in the steamer tracks, ice reconnaissance flights were flown depending solely on radar to detect targets. As a highly qualified radar operator can, under certain conditions, evaluate the radar target denoting it as a ship or iceberg, attempts were made to identify all radar targets. All unidentified targets were listed as possible bergs.

Flight statistics for the season are presented in Table 2: Aerial Ice Reconnaissance Statistics—1965 Season.

Table 2. Aerial ice reconnaissance statistics—1965 season

Month	Number of flights	Number days flights made	Number days good visibility [1]	Average visual effectiveness percent [2]	Maximum number days between flights	Hours flown
March	8	8	10	63.8	4	43.5
April	16	13	15	71.6	7	90.0
May	10	10	12	65.5	6	43.8
June (1-6)	1	1	3	90.0	6	4.9
Total	35	32	40	68.6		182.2

[1] Days on which possible to search visually at least 50 percent of scouting area with 25 mile spacing between legs of flight plan.
[2] Ratio (×100) of area actually searched visually to area planned to be searched.

It can be seen from Table 2 that the reconnaissance flights must be made at that opportune time when visibility is adequate for an effective search. Figure 1 depicts in percent the times the visibility at Argentia (dotted line) and over the cold Labrador Current on the eastern slope of the Grand Banks (solid line) was less than 5 miles. April, May, and June, the months when most bergs endanger the steamer tracks, also unfortunately are those months with the highest percentage of restricted visibility. During these months the principal storm tracks are south of Newfoundland bringing warm moist air in contact with the colder sea surface temperatures on the Grand Banks, particularly over the very cold waters of the Labrador Current. The minor storm tracks for these months pass over northern Newfoundland and, while bringing in relatively drier and colder air than the major storm tracks, the air is often warm and moist enough to cause fog over the Labrador Current.

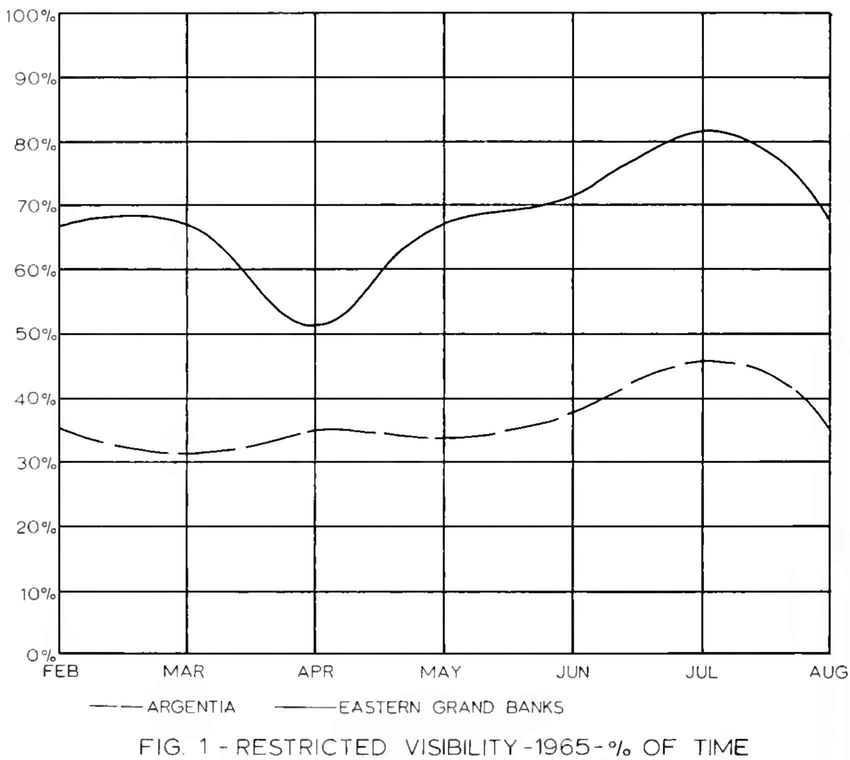

Figure 1.—Restricted visibility—1965—percentage occurrence.

COMMUNICATIONS

The ice reports collected from ships, aircraft, and ice observation agencies were plotted and analyzed, and during periods when aerial

ice reconnaissance flights were made, ice conditions were forecast for the forthcoming 12-hour period. This analyzed or forecast information was used to prepare the ice advisory broadcasts and bulletins, the primary means of disseminating ice information to shipping.

From 1 March to 6 June ice information was broadcast daily to shipping by U.S. Coast Guard Radio Argentia (NIK) at 0048 and 1248 G.m.t. simultaneously on 155, 5320, 8502 and 12880.5 kcs. Each broadcast was preceded by a general call on 500 kcs. with instructions to shift to the above operating frequencies. A 2 minute period of test signals transmitted on the operating frequencies facilitated receiver tuning. Each broadcast was transmitted twice, once at 15 words per minute and once at 25 words per minute. Prescribed radio silent periods were observed. Ice bulletins were also sent via teletype to the U.S. Naval Oceanographic Office, Washington, D.C. for further dissemination twice daily by U.S. Naval Radio Washington (NSS) on the regular "Hydro" broadcasts, for inclusion of a daily ice chartlet in the daily memorandums and for a weekly ice chartlet. Ice bulletins were also sent via teletype to the Canadian Department of Transport, R.C.N. Radio Station, Albro Lake, N.S., and others for further dissemination.

Ice conditions were also transmitted by facsimile at 1330 G.m.t. daily on 5320, 8502 and 12880.5 kcs. Facsimile ice information is more reliable and complete than radio broadcasting as it is not subject to human reception errors and as considerably more information can be incorporated in the facsimile format.

Frequently, regular ice broadcasts concluded with the request that all shipping in the ice patrol area report to NIK all ice sighted, weather conditions, and sea temperatures every 4 hours. The effectiveness and efficiency of the International Ice Patrol was enhanced considerably by the excellent response by shipping to this request.

Duplex radio operations were used between NIK and merchant ships for general radio communications. Merchant ships worked NIK on 500 kcs., and 8 and 12 Mcs. martime calling band. NIK worked 427, 8734 or 12718.5 kcs. as appropriate.

During the 1965 season, Ice Patrol communications involved the handling of 17,668 radio messages and 18,321 landline messages of which 205 were ice broadcasts and 205 teletype bulletins. Statistics concerning the reports received from shipping during the ice season are as follows:

Number of ice reports received from vessels	227
Number of vessels furnishing ice reports	172
Number of sea surface temperatures reported	6, 347
Number of vessels furnishing sea temperatures	876
Number of vessels requesting special information	102
Number of weather reports relayed to U.S. Weather Bureau (METEO, Washington)	554

The percentage distribution of reporting vessels by nationality was as follows:

United Kingdom	23.4	Finland	1.0
United States of America	22.4	Belgium	0.9
Federal Republic of Germany	10.8	Ireland	0.9
The Netherlands	8.5	Poland	0.9
Norway	5.0	Portugal	0.9
Sweden	5.0	Japan	0.7
France	3.1	Iceland	0.5
Denmark	2.2	Panama	0.5
Liberia	2.2	India	0.3
Greece	1.9	Czechoslovakia	0.2
Italy	1.7	Lebanon	0.2
Union of Soviet Socialist Republics	1.7	Switzerland	0.2
Yugoslavia	1.6	Turkey	0.2
Israel	1.4	United Arab Republic	0.2
Canada	1.0	Total	100.0

Throughout the year requests were received from shipping for ice conditions in the steamer tracks. As the International Ice Patrol staff remained at Argentia throughout 1965, these requests were honored. The ice information contained in the answers were based on monthly aerial ice reconnaissance flights performed by the Coast Guard Air Station at Argentia and from sparse information received from other sources. Due to the very small distribution of bergs south of Hudson Straits, assumptions that bergs did not penetrate the steamer tracks could be made with good assurance. One berg entered track G on 4 December 1965 near latitude 52°30′ N., longitude 51°15′ W. and drifted easterly with the wind conditions. This berg drifted from the coastal Labrador waters southeastward under the effect of the ocean currents and the northwesterly winds that prevailed for the latter part of November and the first few days of December.

Thirty-three ice requests were received and answered from ships representing Italy, Norway, Sweden, United Kingdom, United States of America, and the Soviet Union from 1 January 1965 until the Ice Patrol radio broadcasts were initiated on 1 March. During the period from the termination of the Ice Patrol services on 6 June until 13 December 1965, 236 ice requests were received. The distribution of ice requests by reporting vessels by nationality was as follows:

Norway	43	Belgium	4
Federal Republic of Germany	40	Lebanon	4
United Kingdom	48	Iceland	3
United States of America	24	India	2
Sweden	21	Israel	2
Netherlands	15	Panama	2
Liberia	14	Spain	1
Denmark	13	Yugoslavia	2
Greece	10	Union of Soviet Socialist Republics	1
Italy	8		
Finland	5		
France	5	Total	269

MONTHLY ICE CONDITIONS—1965

JANUARY

The Grand Banks area remained clear of ice in the first half of January. One berg entered the Grand Banks area in the last half of the month.

By the middle of the month field ice extended down to the Strait of Belle Isle and eastward to Belle Isle. During the latter part of the month the field ice limits gradually extended themselves southward. On the 22d the southern limits were at Fogo Island extending north northeast to approximately 53° N. By the 29th, open pack field ice had penetrated Bonavista Bay extending to Fogo Island, eastward approximately 40 miles, then northward. Figure 2 shows the distribution of bergs south of Cape Chidley, Labrador.

The Canadian Department of Transport considered the Strait of Belle Isle unsafe for the passage of shipping by the 8th. Field ice extended to almost as far south as Bird Island by the 26th. Sea ice began to form in the western part of the Gulf of St. Lawrence in mid-January extending past Magdalen Islands in the latter part of the month.

FEBRUARY

No ice reconnaissance flights were flown over the northern Grand Banks area in the first half of the month. North of latitude 51° N., to latitude 53° N., 63 bergs were observed to approximately 120 miles off the coast. Field ice limits encompassed this area.

By mid-month field ice had advanced to latitude 47° N. and to approximately 60 miles off the coast. In the latter part of the month strong warm southerly winds made the field ice recede to north of latitude 48°30′ N. and open pack now extended north of latitude 49° N.

Close pack ice covered the Gulf of St. Lawrence, closing in entirety the Straits of Belle Isle and Cabot Straits. Only a small area from Cape Ray to Cape St. George, Newfoundland remained open. Field ice continued to flow southward around Scatari Island.

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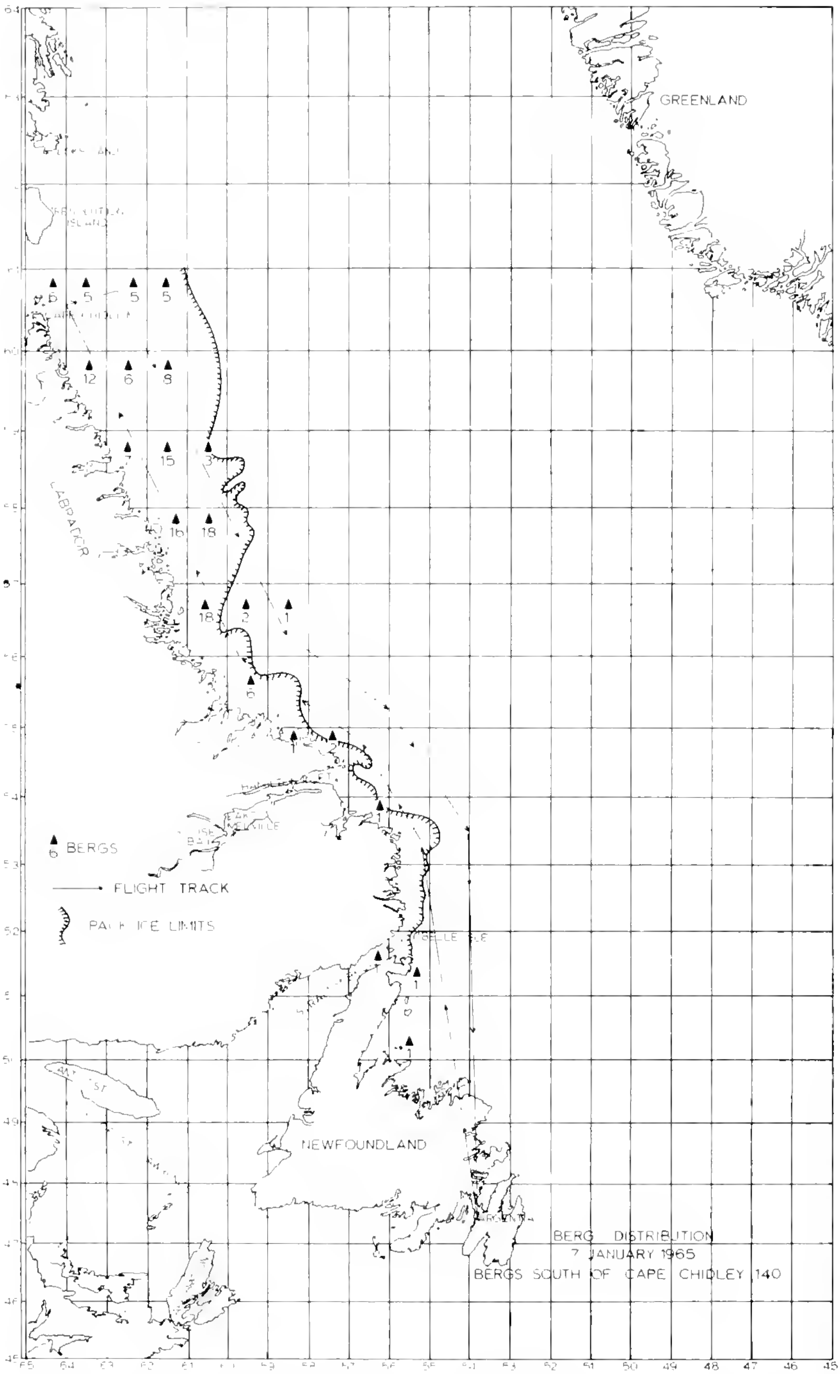

FIGURE 2.—Ice conditions Newfoundland to Labrador on 7 January 1965.

By now the bergs previously noted north of latitude 51° N. had drifted southward and were to be found concentrated from Cape Bonavista, north northwest to approximately 120 miles off the coast of Newfoundland opposite Groais Island. As usual the bergs were entrapped within the sea ice limits. Only one berg, located approximately 60 miles northwest of Virgin Rocks, was to be found on the Banks. Figure 3 shows the distribution of bergs south of Brevoort Island, Baffinland.

MARCH

Continuation of warm winds improved ice conditions. The southward drift of field ice was compensated by the deterioration of its leading edges. By mid-month the field ice had again advanced to latitude 48° N. Onshore winds through the 21st continued to contain the field ice, considered open pack, and the bergs along the coast. Several bergs drifting in the Labrador Current reached as far south as latitude 46°54′ N. on the eastern slope of the Banks. The drift of the field ice within the Labrador Current was negligible and the southern extension was, by mid-month, just south of latitude 48° N. Most bergs were contained within the limits of the field ice.

During the second half of March, south of Cape Freels, colder than normal air temperatures accompanied the westerlies. North of latitude 50° N. onshore winds prevailed. As a result, almost half of the bergs, grounded for about 1 month near Cape Freels, drifted easterly and moved rapidly southeasterly under the influence of strong west northwest winds and the Labrador Current. Eighteen bergs drifted south across latitude 48° N. Ten bergs remained on the northern slopes of the Banks with seven following the eastern contours of the Banks. The southernmost berg was located well eastward, being at latitude 45°20′ N., longitude 45°50′ W. By the 30th, under normal weather conditions, the field ice and bergs had drifted south to approximately latitude 47°25′ N., west of longitude 50° W. This is south of the eastern component of the Labrador Current and boded well. Figures 4, 5, and 6 show the distribution of bergs south of Cape Chidley.

APRIL

Aerial ice reconnaissance flights on the 1st and 2d showed an influx of ice on the northern Grand Banks as far south as latitude 47°20′ N. The field ice had drifted eastward to about longitude 49° W. East of longitude 50°30′ W. it was open pack. One small berg located at latitude 46°07′ N., longitude 47°16′ W. was in the southward-moving core of the Labrador Current. Maximum sea ice penetration occurred on the 1st, but St. Johns remained open. In the next several days high southwesterly and southeasterly winds caused the sea ice to recede to north of latitude 48° N. By the 8th the field ice was deteriorating rap-

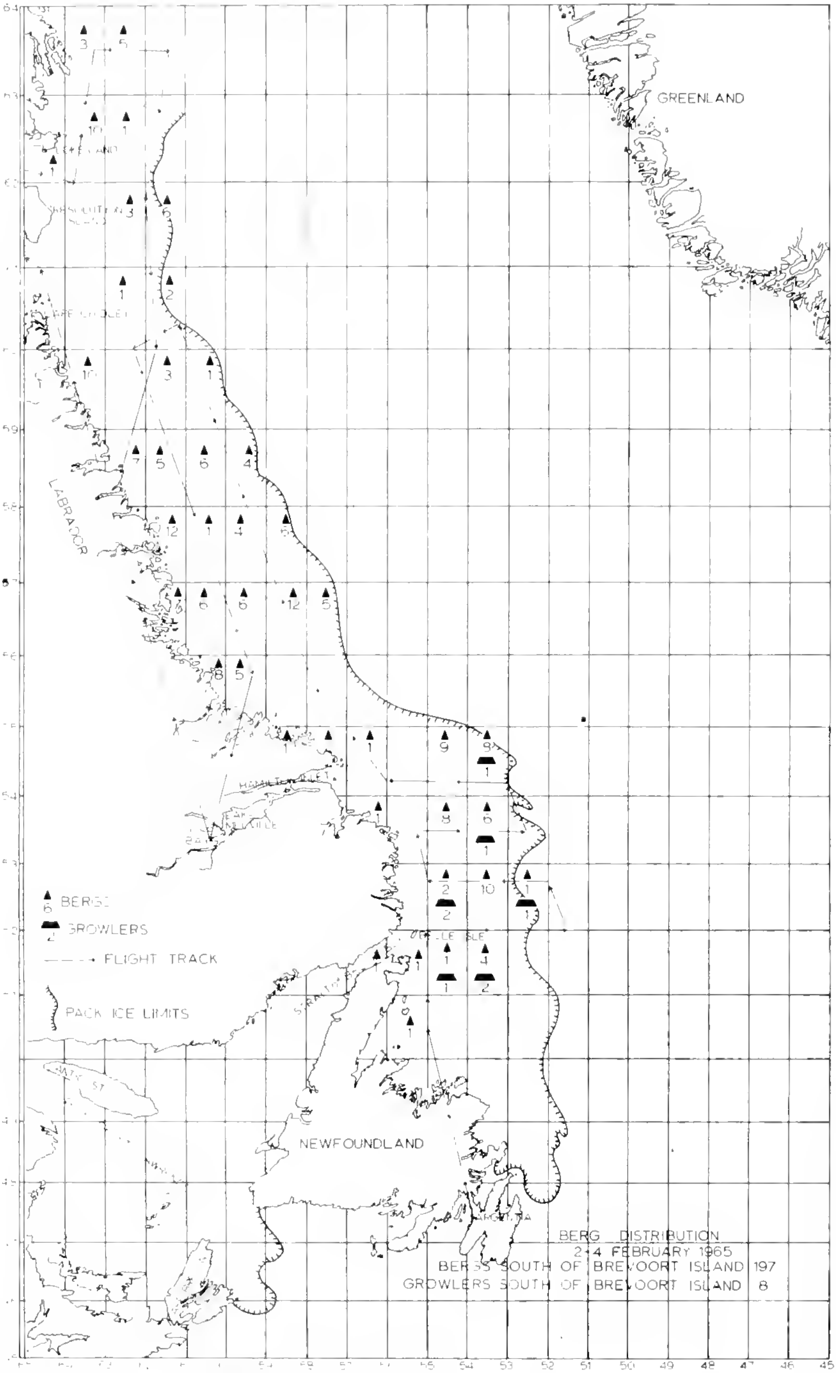

FIGURE 3.—Ice conditions Newfoundland to Labrador, 2–4 February 1965.

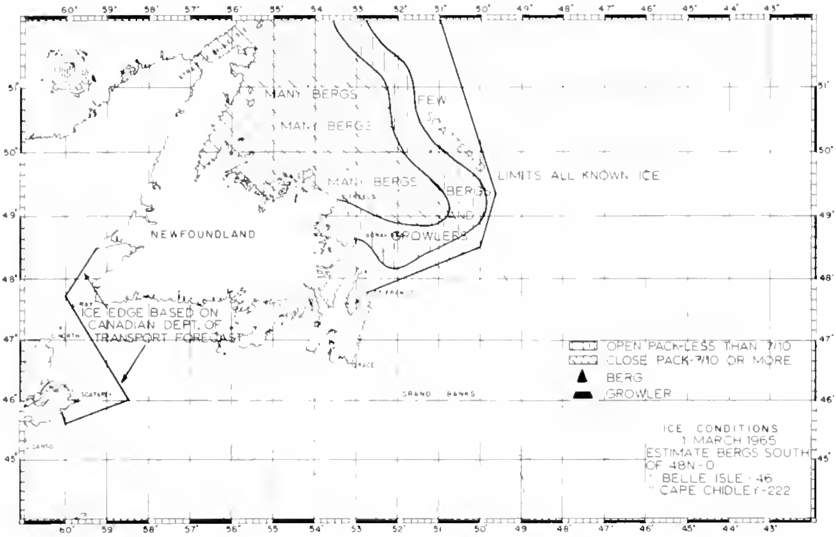

FIGURE 4.—Ice conditions—Grand Banks on 1 March 1965.

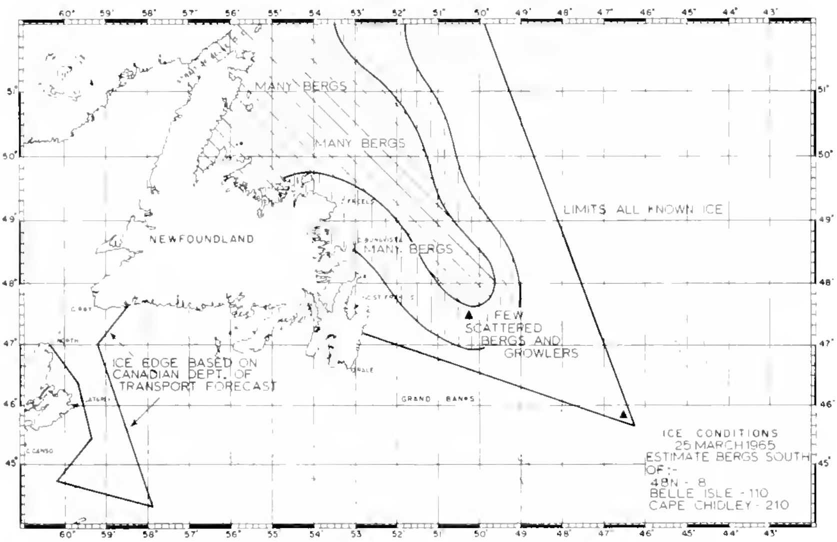

FIGURE 5.—Ice conditions—Grand Banks on 25 March 1965.

idly east of longitude 51° W. All bergs, but for seven south of latitude 48° N. and several growlers, remained within the field ice limits. By the 15th prevailing westerlies had drifted all sea ice eastward to longitude 46°20′ W. and northward of latitude 47°30′ N. With increased diurnal warming, air and sea temperatures increased and field ice gradually melted until by the 22d there was only open brash spread out unevenly to latitude 48° N., longitude 48°30′ W. By the 30th all field

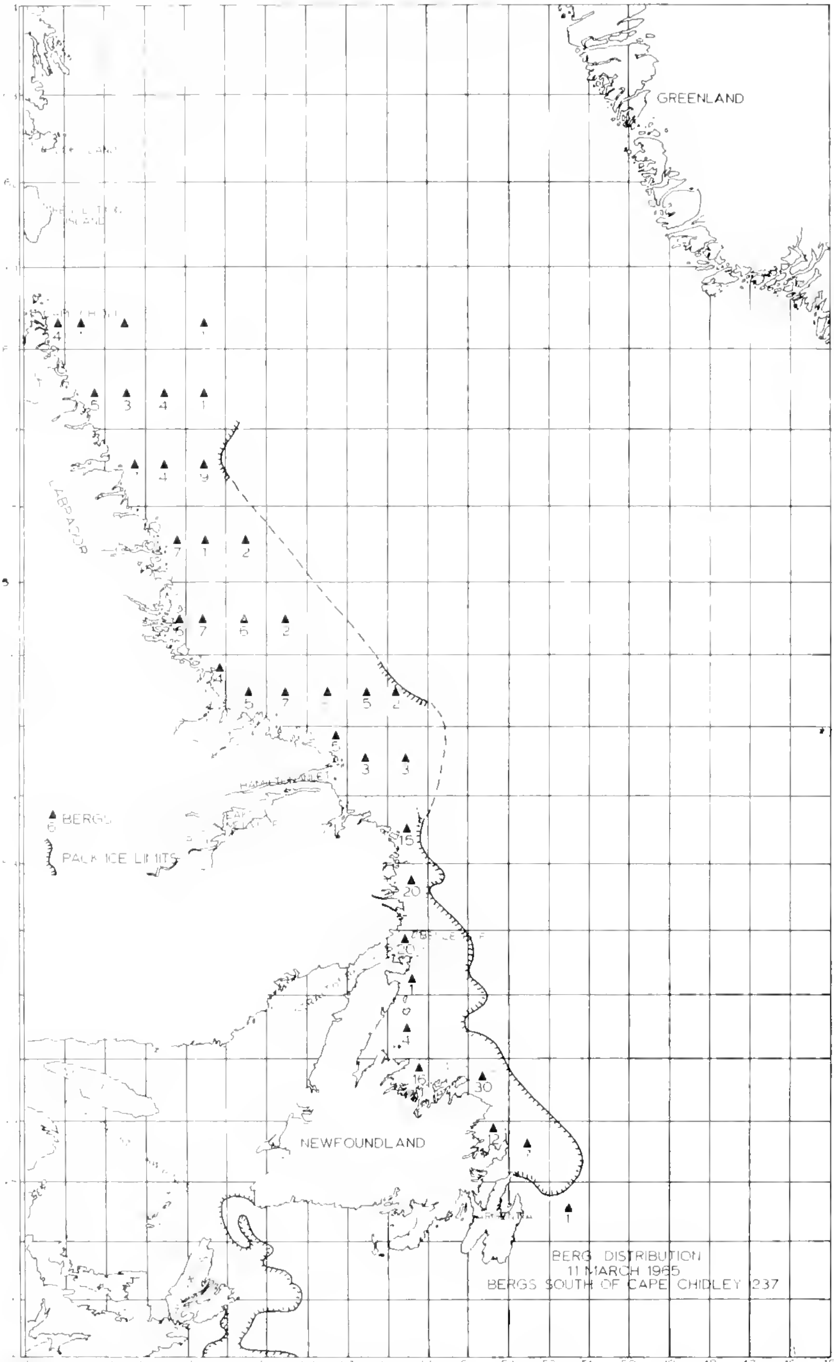

FIGURE 6.—Ice conditions—Newfoundland to Labrador on 11 March 1965.

ice on the northern Grand Banks and the Avalon Peninsula had disappeared.

During the period 12–30 April few bergs drifted south of latitude 48° N. Wind conditions for this period were moderate southeasterly to easterly. Berg drift due to wind conditions was offset by the drift of the Labrador Current. The general drift pattern was to contain the bergs north of latitude 47° N. Fifty-nine small to medium bergs were dispersed from Fogo Island to 46°20′ W. Of these, only 44 were so located as to possibly cause any threat to the steamer lanes. During this month 33 bergs drifted south of latitude 48° N. The southernmost berg was located at latitude 45°20′ N., longitude 45°20′ W. on the first. By the end of the month 10 bergs remained south of latitude 48° N. Figures 7, 8, 9, and 10 show the distribution of bergs south of Cape Chidley, Labrador.

MAY

During the month winds were generally light to moderate (10–25 knots) and varied from northeasterly to southeasterly. The overall pattern was of negligible importance on berg drift. In the early part of the month six bergs drifted south of latitude 48° N. with the Labrador Current. By mid-month 3 bergs were located in the Labrador Current and 6 were west of Virgin Rocks. The latter bergs drifted near Cape Race and eventually deteriorated by the end of the month except for one located at latitude 46°08′ N., longitude 52° W. One berg in the Labrador Current penetrated to latitude 42°43′ N., 49°32′ W. where by the 28th it rapidly deteriorated. No other bergs entered steamer tracks C and D or beyond to the south during the month.

A flight on the 27th observed only 29 bergs from Cape Freels to the approaches to Hamilton Inlet. Figures 11, 12, and 13 show the distribution of bergs south of Cape Chidley, Labrador, plus bergs counted in the Cape Melville, Greenland area on the 15–17th.

JUNE

Only one berg, that observed in late May, was located south of latitude 48° N. It was located at latitude 46°08′ N., longitude 52° W. and by the 17th had completely deteriorated.

During the remainder of the month the majority of the bergs situated in the coastal waters of Newfoundland had drifted to this area earlier in the season and were slowly deteriorated. On the 3d, 43 bergs were located north of Cape Bonavista to Belle Isle. A tongue of field ice extended from Belle Isle to just south of Groais Island. By the 17th, 48 bergs were located south of Belle Isle to Trinity Bay, with approximately 60 bergs located in the approaches and in the Straits of Belle Isle. Field ice continued to prevail in the Straits. Figure 14 shows the distribution of bergs south of Cape Chidley, Labrador.

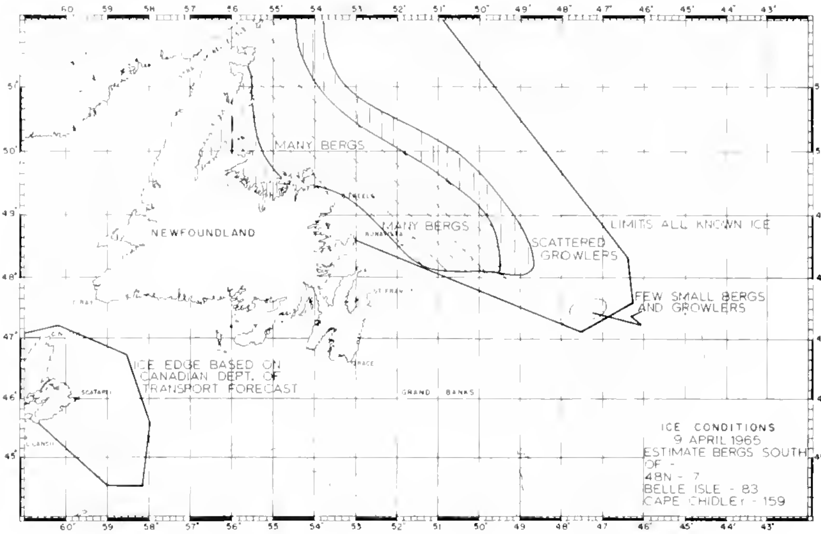

FIGURE 7.—Ice conditions—Grand Banks on 9 April 1965.

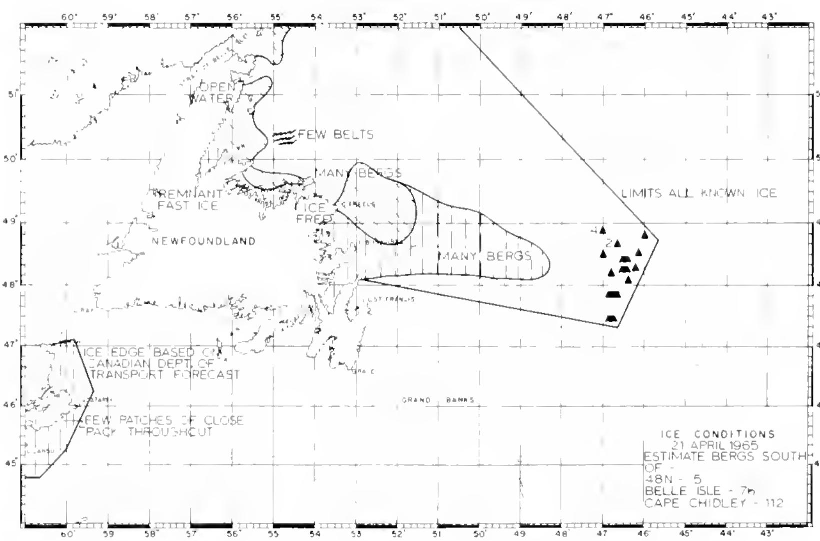

FIGURE 8.—Ice conditions—Grand Banks on 21 April 1965.

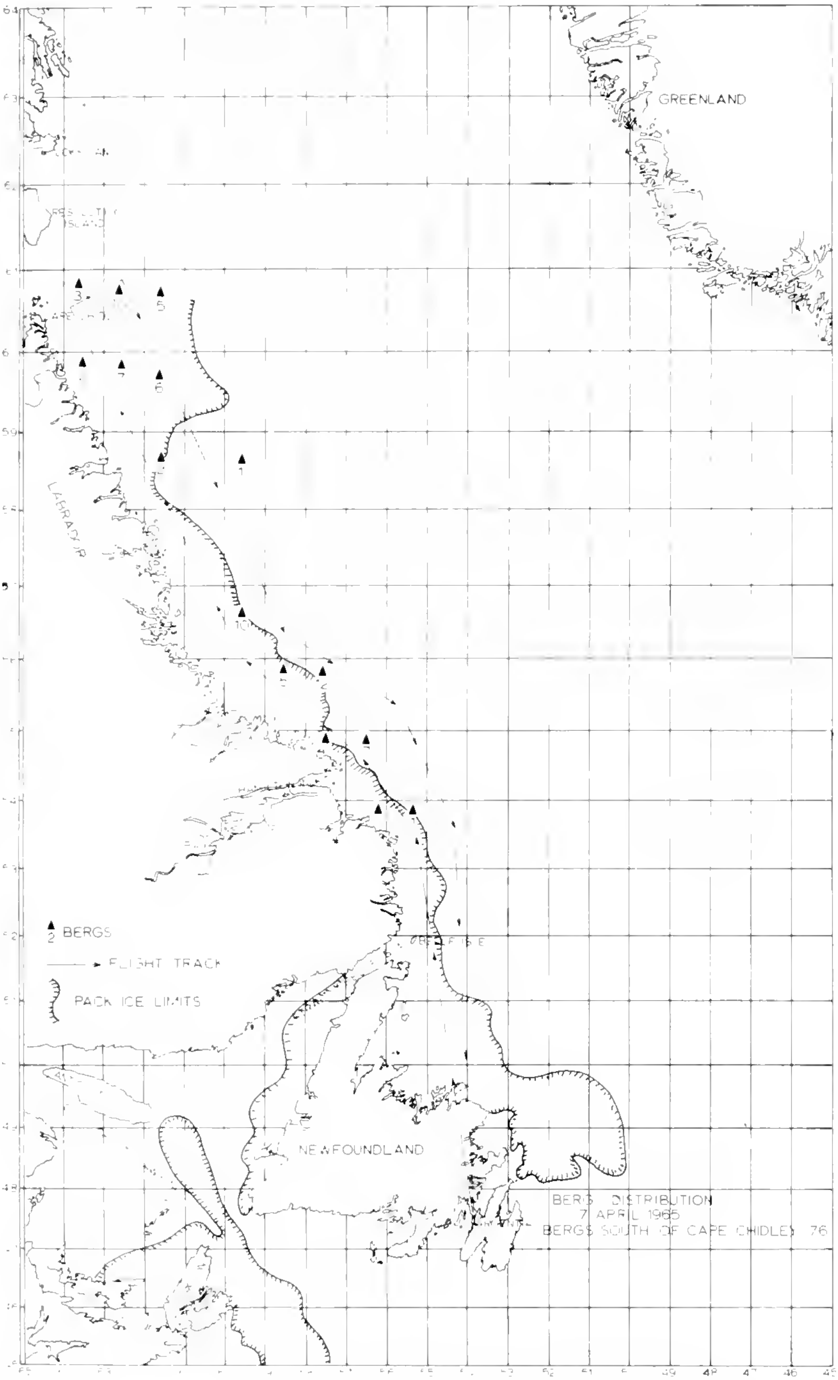

FIGURE 9.—Ice conditions—Newfoundland to Labrador on 7 April 1965.

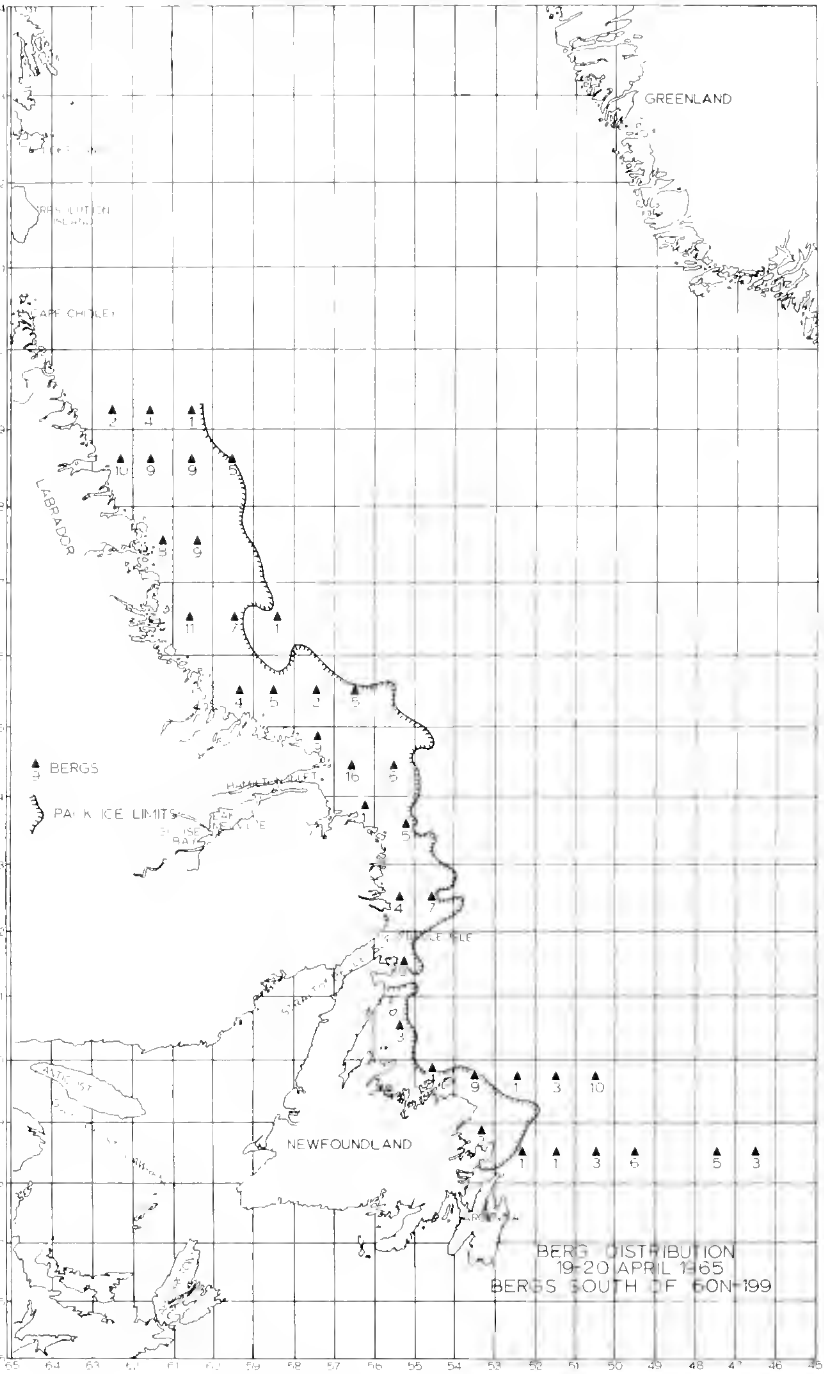

FIGURE 10.—Ice conditions—Newfoundland to Labrador on 19–20 April 1965.

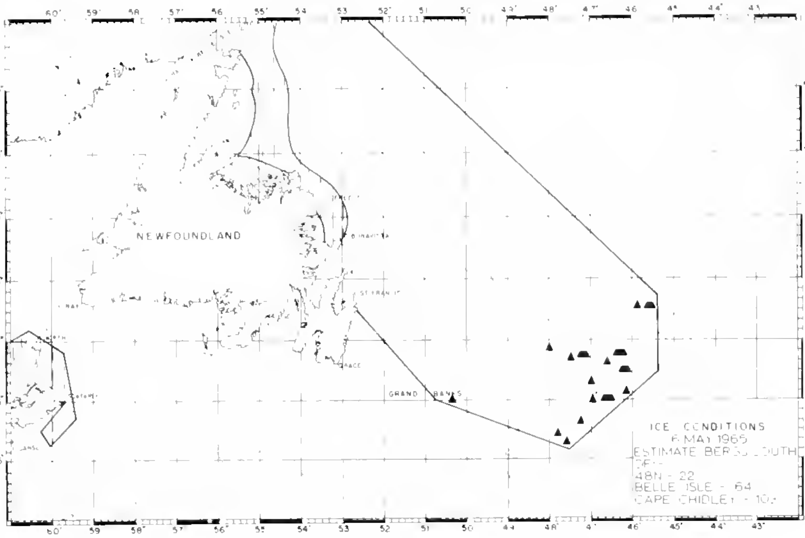

FIGURE 11.—Ice conditions—Grand Banks on 6 May 1965.

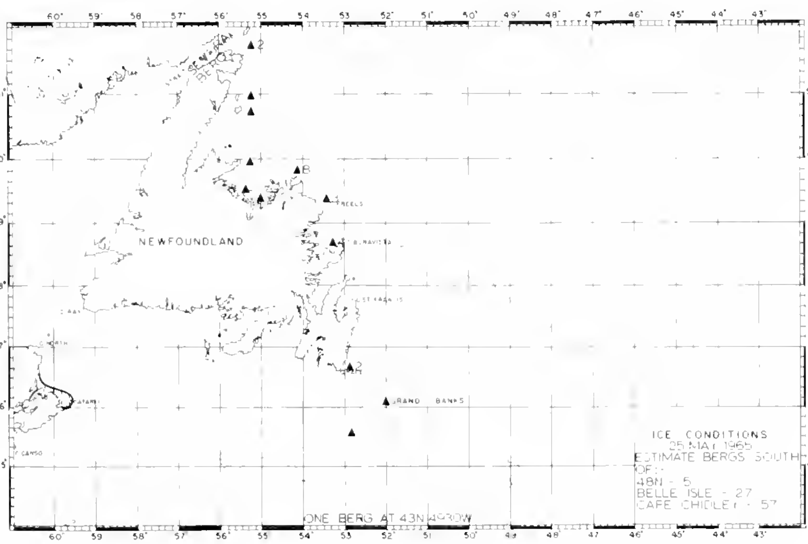

FIGURE 12.—Ice conditions—Grand Banks on 25 May 1965.

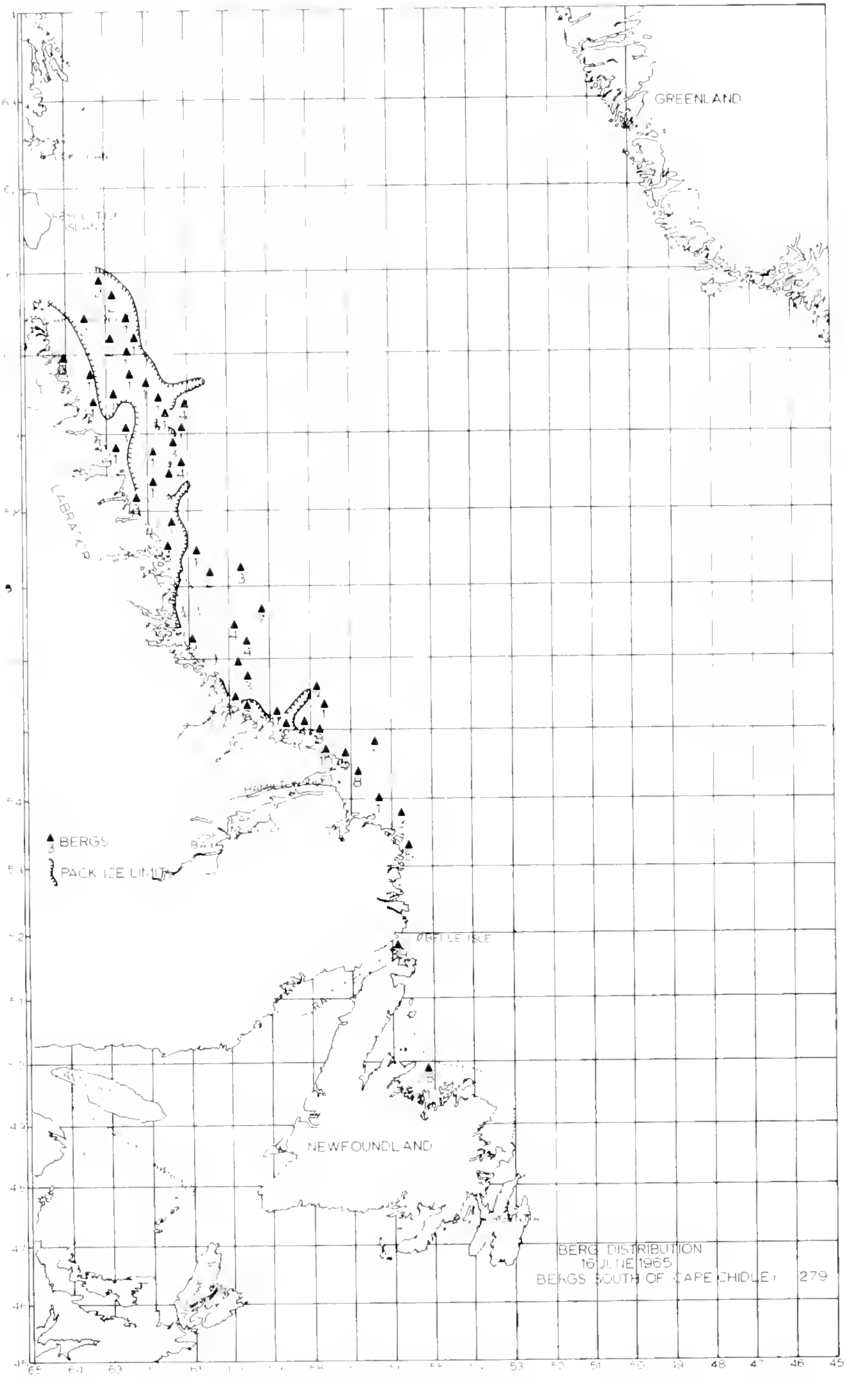

FIGURE 14.—Ice conditions—Newfoundland to Labrador on 16 June 1965.

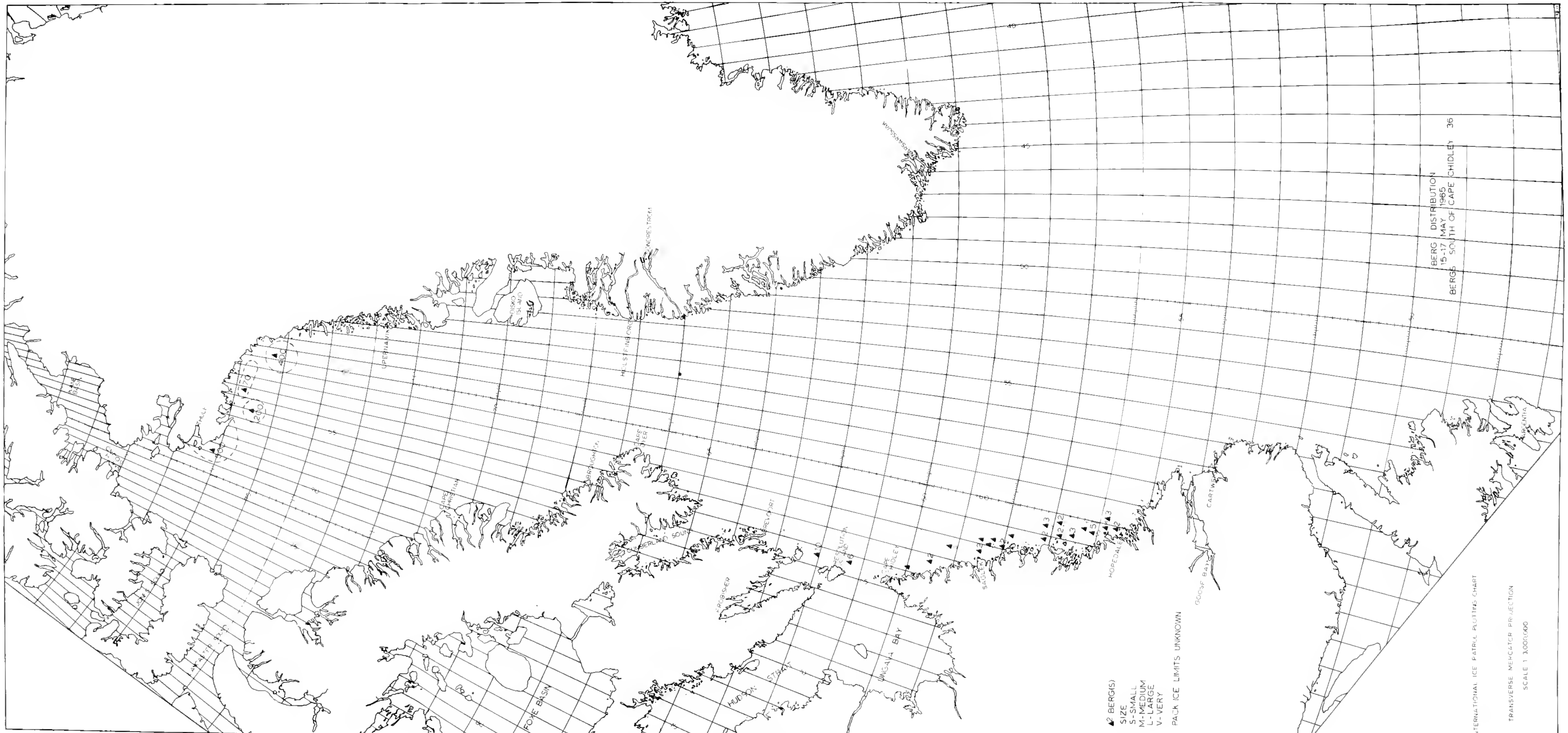

FIGURE 13.—Ice conditions—Newfoundland to Labrador and Melville Bay on 15-17 May 1965.

JULY–DECEMBER

On the 2d of July, 46 small bergs were located in Newfoundland coastal waters from Notre Dame Bay to Belle Isle. They disappeared by August. Field ice disappeared completely by early July. During August and September several straggler bergs were reported in the Straits of Belle Isle. No ice was reported south of Belle Isle for the months of October and November, and only one berg was reported in December. On December 4th, a berg was reported at latitude 52° 25′ N., longitude 51°12′ W. where due to prevailing winds it drifted east just south of steamer track G. Figures 15 through 20 show the distribution of bergs north of the Grand Banks through December 1965.

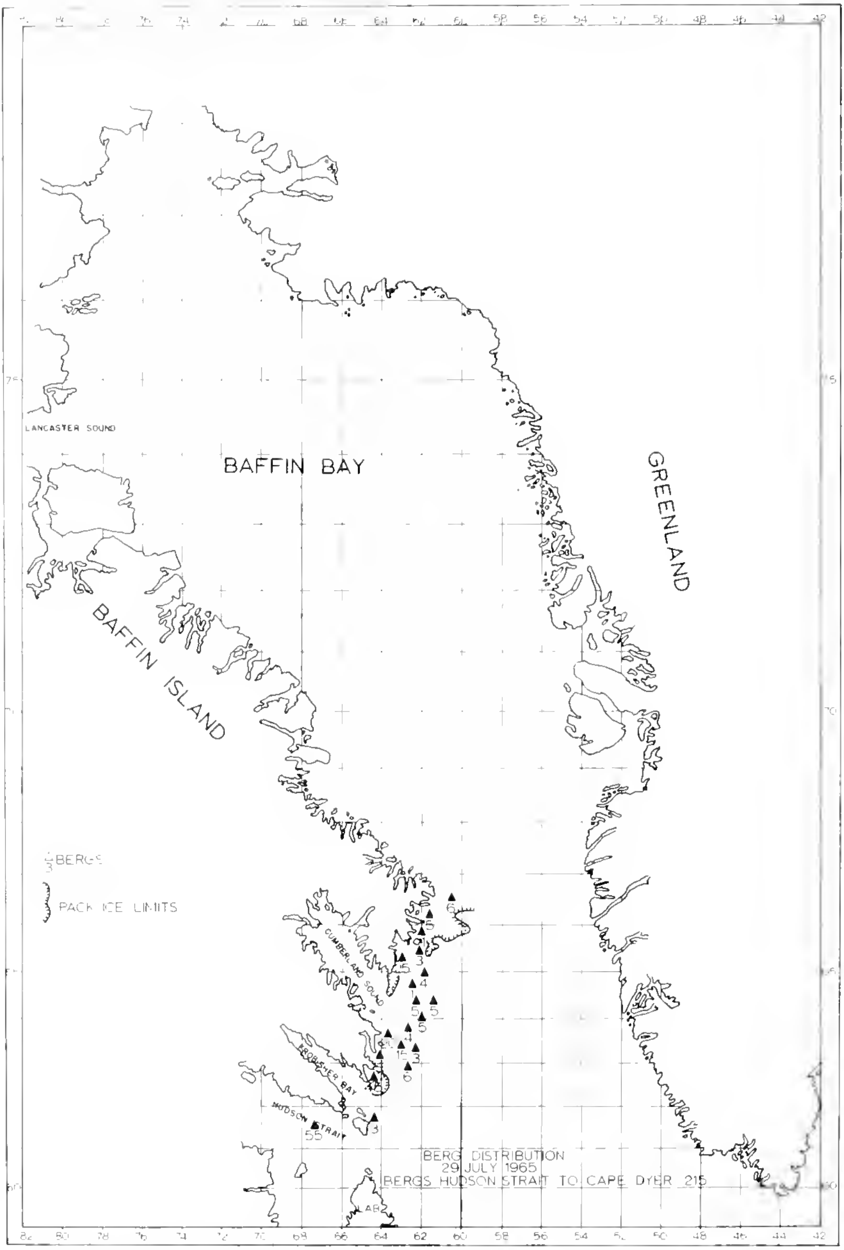

FIGURE 15.—Ice conditions—Baffin Island area on 29 July 1965.

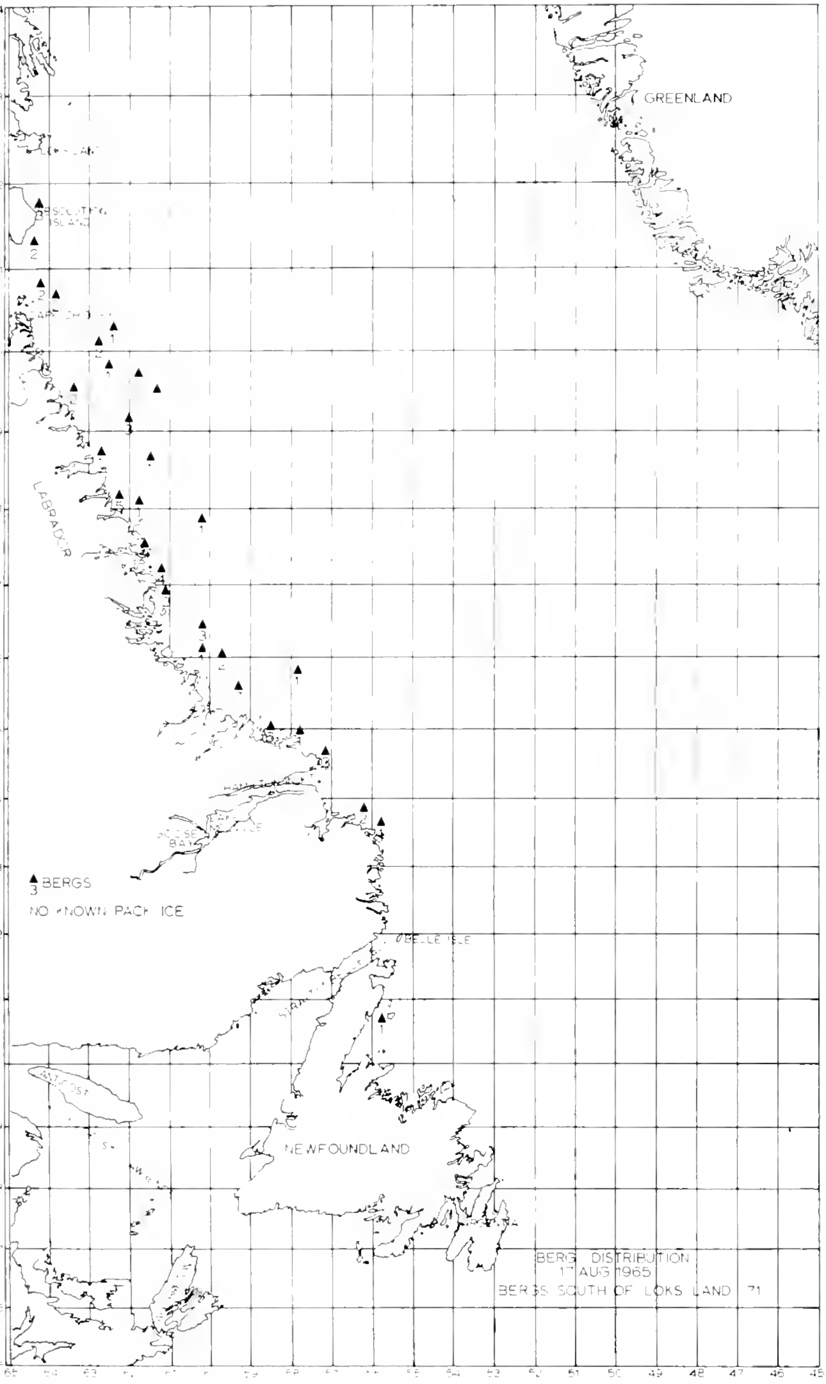

FIGURE 16.—Ice conditions—Newfoundland to Labrador on 17 August 1965.

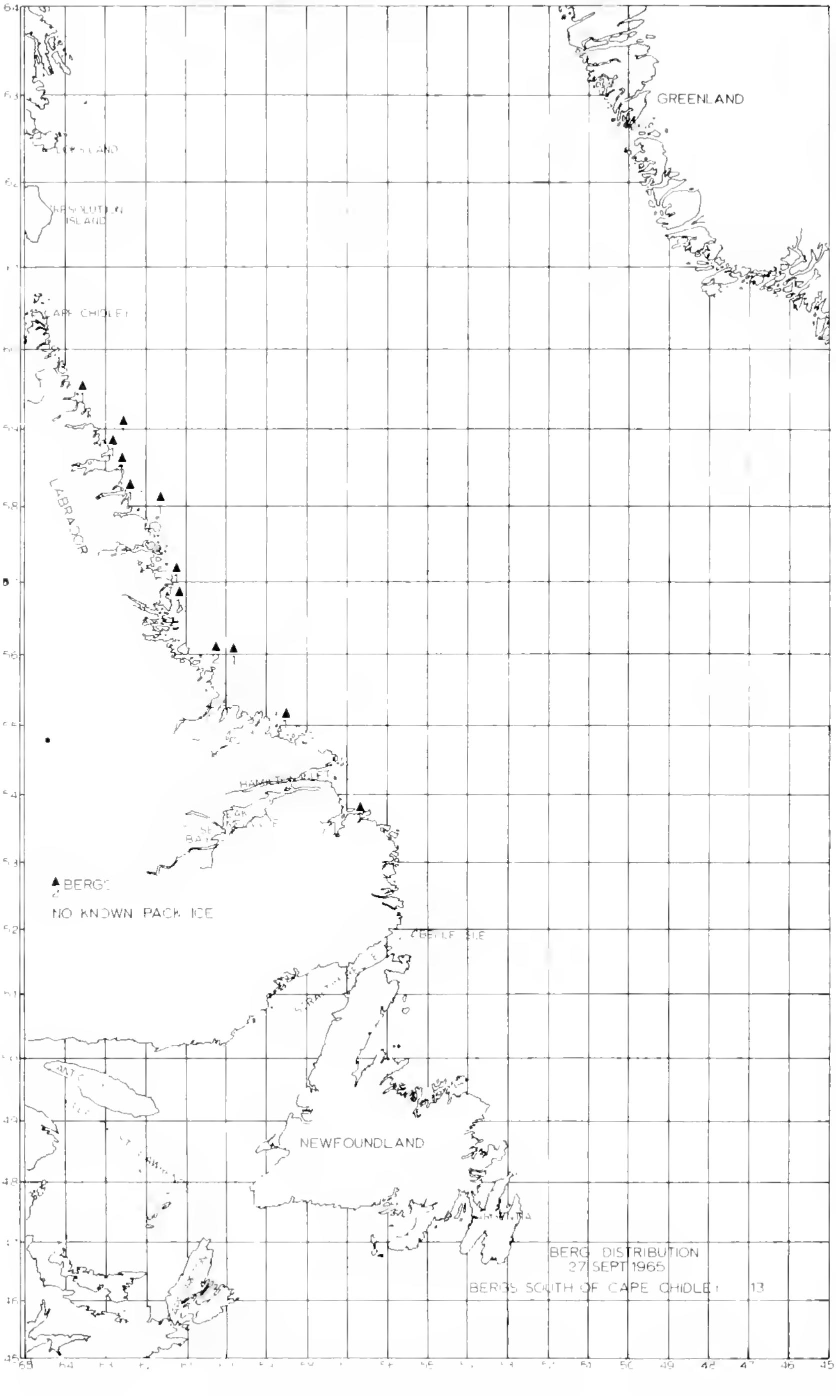

FIGURE 17.—Ice conditions—Newfoundland to Labrador on 27 September 1965.

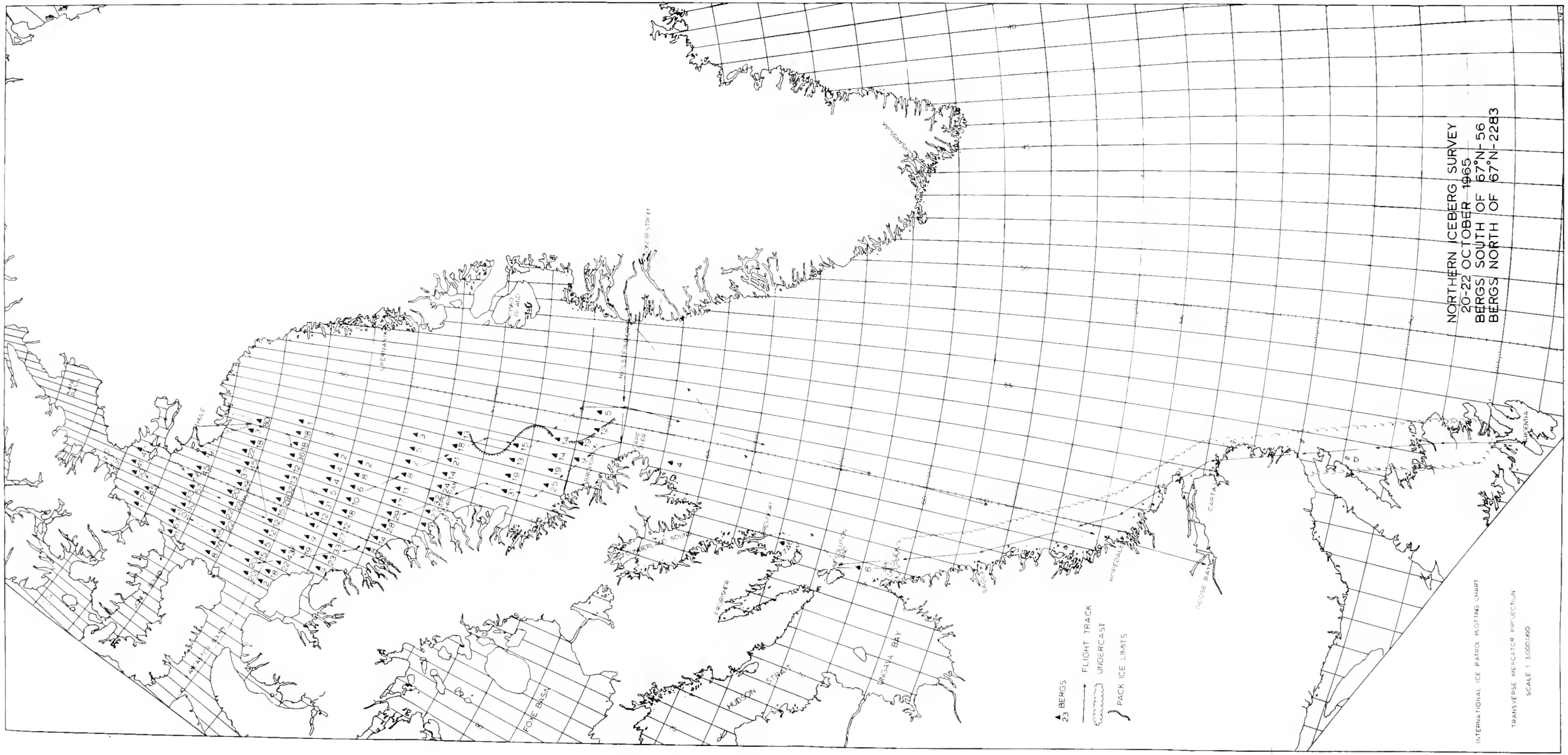

FIGURE 18.—Iceberg survey, Newfoundland to Baffin Bay, 20–22 October 1965.

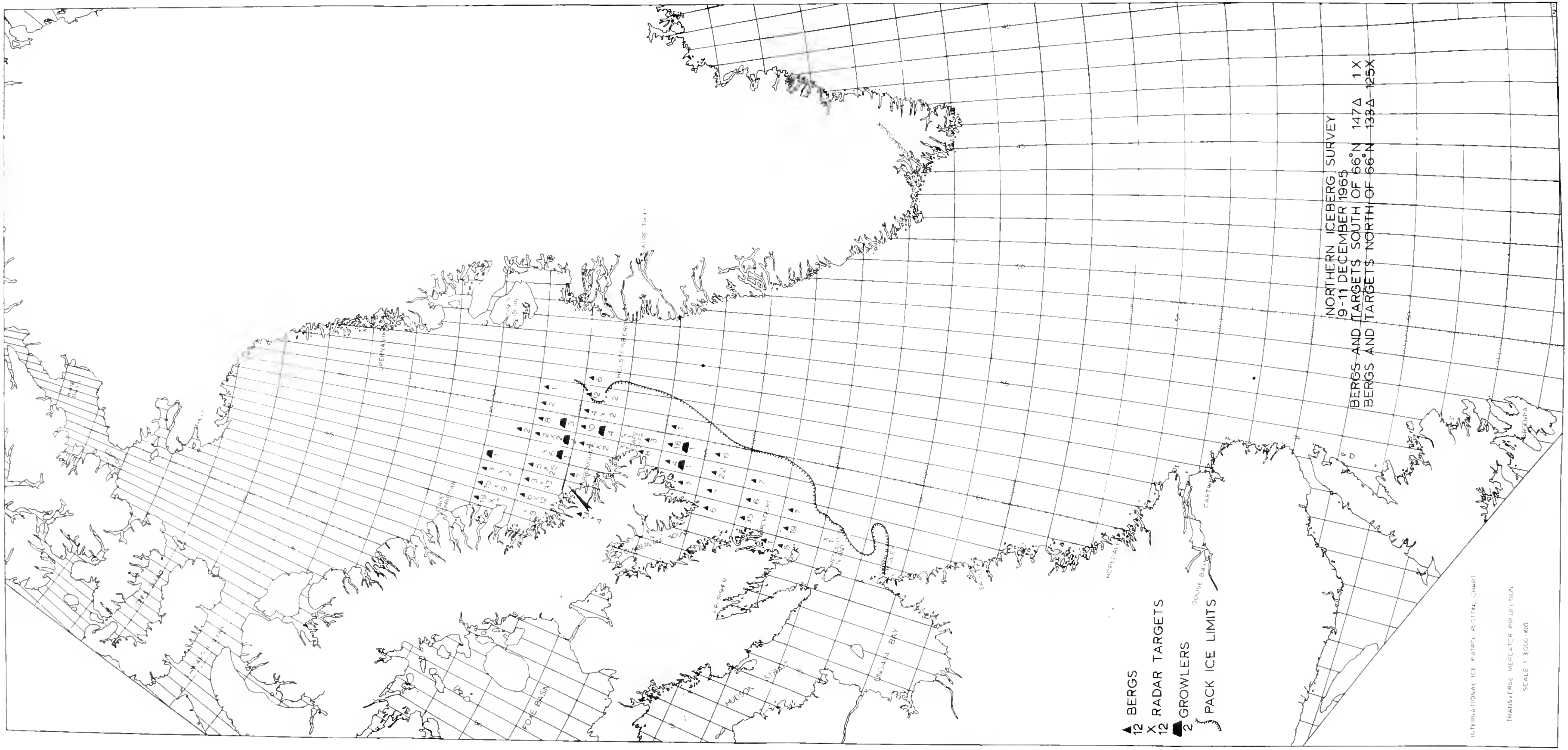

FIGURE. 19.—Iceberg survey, Newfoundland to Baffin Bay, 9–11 December 1965.

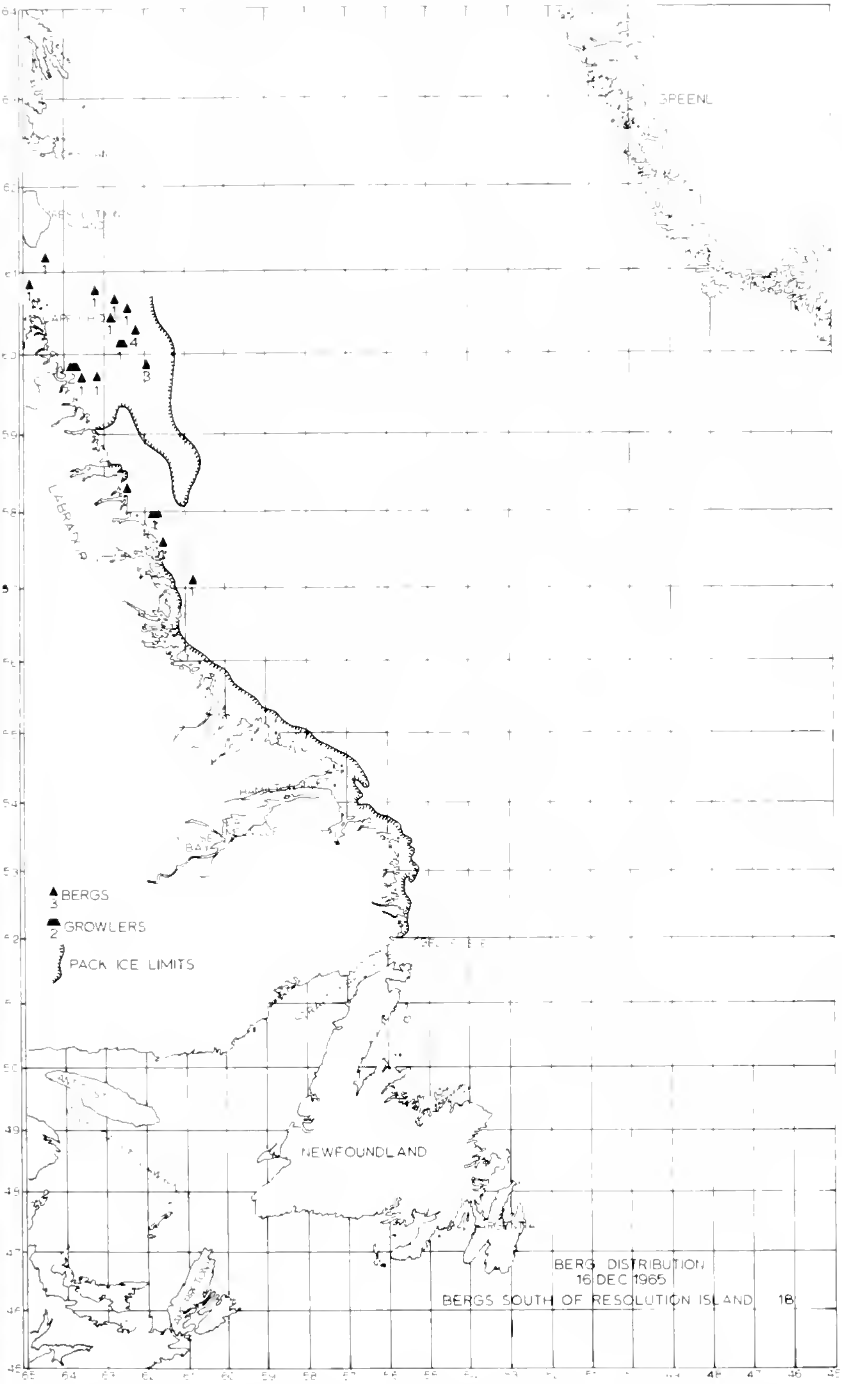

FIGURE 20.—Ice conditions—Newfoundland to Labrador on 16 December 1965.

INVESTIGATIONS INTO ICEBERG SIZE AND DISTRIBUTION

The collection of data to assist in forecasting seasonal berg conditions on the Grand Banks was continued. Bulletin No. 50 discussed the interrelation of meteorological, climatological, and oceanographic conditions, and land and bathymetric configuration on ice and berg distribution. Additional data are presented on aerial berg surveys, frost degree days of selected Baffin Island-Labrador-Newfoundland coastal stations on the relative severity of the Grand Banks ice season, the effect of mean sea level atmospheric pressure distribution on the Grand Banks ice season, and correlation of these statistics to the 1965 and 1966 berg seasons. Refer to the U.S. Coast Guard Oceanographic Report Series (CG–373) for oceanographic investigations into the drift of bergs as controlled by the currents of the Grand Banks and berg drift and deterioration studies as conducted by the U.S. Coast Guard Oceanographic Unit, Washington, D.C.

NORTHERN AERIAL ICEBERG SURVEYS

The aerial berg surveys conducted north of the Grand Banks and including all of the western Baffin Bay-Labrador Sea area were continued. As mentioned in Bulletin No. 50 of these series, the intent of these surveys is to accumulate statistical data on berg size and distribution with respect to the months of the year and to correlate the berg distribution with the other factors noted earlier in this publication. Figures 2 through 20 show the distribution of bergs for the various areas observed. Figures 18 and 19 are the northern aerial berg surveys.

In figures 18 and 19 the number of bergs distributed by latitude, noted in the lower righthand corner, comprise the number of bergs observed on the days noted plus an estimate, based on other information, of bergs south of the area covered by that particular flight. No estimate is made of bergs that may not have been observed. When during each flight visibility was reduced to less than 20 miles, radar was also used to detect targets. An inflight estimate was made of the value of each radar target and depending on the circumstances the target was marked as "radar target-possible berg" on the inflight chart. When field ice covered the sea surface and with reduced visibility, the radar operator evaluated the radar blip as a berg or other target. This was done by viewing the shadow that fell behind the target on the PPI scope. Leads in ice, hummocks, ridges, etc. in the field ice do not present as distinguishable a characteristic blip as a berg. However, use of radar to detect bergs located in field ice is inexact.

These surveys have provided some insight into the distribution of bergs as affected by the related factors. It is considered important to continue this work until a sufficient amount of statistical data has

been compiled. Physical oceanographic investigations of the Labrador Sea-Baffin Bay areas have delineated the oceanic circulation to some extent, but being somewhat lacking in detail, further investigations should be made. Information is available today on the meteorological conditions of this area, and somewhat sparse climatological data are also available. The U.S. Naval Oceanographic Office ice program data, acquired mainly by aerial reconnaissance, and their ice forecasting provide a suitable insight into climatological conditions of this area, particularly as it applies for our purposes, to iceberg environmental conditions. The aerial berg surveys commenced by the U.S. Coast Guard in 1962 will eventually provide berg distribution data that can better be correlated with meteorological and climatological conditions and permit better forecasting of expected berg distribution on the Grand Banks. It is also expected to keynote the areas and data that must be investigated more thoroughly to obtain quantitative techniques. It now appears, though somewhat tenuously, that berg reconnaissance of key northern areas during December and January will provide the berg distribution data required. It is considered important to continue the northern surveys, until sufficient data has been compiled.

PRESEASON 1965 NORTHERN ICEBERG SURVEYS

The first 1965 preseason northern berg survey was conducted during 21–23 October 1964. For the first time, ice conditions were determined along the entire route of bergs from the northwest Greenland glaciers to the Grand Banks. The next northern berg survey was conducted 6–8 December 1964 from Argentia, Newfoundland to Cape Christian, Baffinland. Refer to Bulletin No. 50 (Season of 1964) for details of the data on berg size and distribution and on the basic discussions and assumptions in the correlation on berg size and distribution during northern surveys to the number of bergs drifting south of latitude 48° N.

On the basis of the 6–8 December survey and basic assumptions, 135 bergs were forecast to drift south of latitude 48° N. during the 1965 ice season provided normal climatology had prevailed; with unfavorable conditions, only 75 bergs were to be expected. Conditions unfavorable to berg drift and retention prevailed and 76 bergs drifted south of latitude 48° N. Refer to the section on March and April ice conditions in this Bulletin for a brief discussion on these factors.

POSTSEASON 1965 NORTHERN AERIAL ICEBERG SURVEYS

The northern aerial surveys can be grouped into monthly aerial surveys from Newfoundland to Cape Chidley, Labrador, and the several northern berg census flights of western Baffin Bay. Figures 2 through

20 depict the flights to Cape Chidley. Figures 18 and 19 depict the census flights of western Baffin Bay.

The first northern survey to determine the 1966 Grand Banks berg supply was made on 20–22 October 1965. Three flights were required to cover the areas of interest and were:

1. 20 October; Argentia to Sondrestrom, Greenland; 7.0 hours, 30 percent visual effectiveness; 90 percent radar effectiveness; coverage included continental shelf waters from Notre Dame Bay, Newfoundland to Cape Dyer, thence across Davis Strait to Holsteinsborg, Greenland.

2. 21 October; Sondrestrom, Greenland to Thule, Greenland; 6.9 hours; 30 percent visual effectiveness, 90 percent radar effectiveness; coverage included coastal waters of Baffin Island from Cape Dyer to Bylot Island, Devon Island and Ellesmere Island, north to Smith Sound, thence to Melville Bay and Thule, Greenland.

3. 22 October; Thule, Greenland to Goose Bay, Labrador; 6.8 hours; 30 percent visual effectiveness; 90 percent radar effectiveness; coverage offshore of second day's flight including west half of Baffin Bay and Davis Strait. See figure 18 for track and ice plot. Bergs were distributed as follows:

Region	Size				Total
	Small	Medium	Large	Unclassified	
South of Belle Isle to Cape Chidley, unobserved (very few are known to have been in this zone):					
61° to 67° N	52			5	57
67° to 71° N	167	27	15	138	347
71° to 73° N	122	38	5	106	271
73° to 76° N	343	263	179	191	976
76° to 78° N	317	84	47	241	689
Total					2, 340

Due to the poor visibility encountered during these flights it is estimated that the berg count may be greater by as much as 10 percent of that actually observed. The berg sizes were based on actual sightings but due to the numbers present at one time a group size was estimated from which a distribution on size was arrived. The "Unclassified" column pertains to radar targets classed as possible bergs.

On the basis of similar observations in 1964 it is assumed, on the basis of berg group travel times, that the 1966 Grand Banks berg potential was mostly located in an area from off Cumberland Sound northward to Devon Island, to Cape York, Greenland and thence south, or in western Baffin Bay. Field ice observed during this flight was sparse and mostly very open pack with new ice occurring in the northern areas. The most dense pack was to be found along Baffin Island.

The next northern berg survey was conducted on 9–11 December 1965 from Argentia, Newfoundland to Cape Christian. See figure 19. Two flights were made as follows:

1. 9 December; Argentia to Sondrestrom, Greenland; 7.3 hours; 65 percent visual effectiveness; coverage, east coast of Labrador to 60 miles offshore; the east coast of Baffin Island to Cape Dyer and across Davis Strait to Holsteinborg, Greenland.

2. 10 December; Sondrestrom to Goose Bay, Labrador; 7.3 hours; 65 percent visual effectiveness; coverage, east coast of Baffin Island to 70° N., thence to Cape Chidley.

The following determinations were made on the basis of this survey. Bergs were distributed as follows:

Area	Size				Total
	Small	Medium	Large	Unclassified	
South of Belle Isle	0	0	0	0	0
Belle Isle to 58° N	0	0	0	0	0
58° N. to Cape Chidley	0	0	0	11	11
Hudson Strait to Loksland	11	4	3	1	19
Loksland to Cape Dyer	96	42	1	27	166
Cape Dyer to Cape Christian*	63	13	0	134	210
Total	170	59	4	173	406

*Only to 70° N.

A comparison of the flights conducted in October and December 1965 with those of 1964 yields the following results:

1. October flights

The 1965 flight showed a berg crop of approximately 1,085 less than the previous year. If a discount were to be made of the poor visibility in 1965, 40 percent of the bergs would have had to have been overlooked, either visually or by radar for a comparable berg count, a consideration which, when compared to the distribution of bergs by visual observations alone, appears unwarranted. A direct comparison of berg size and distribution cannot be made. The 1964 observations consider as important to the forthcoming berg crop, those bergs in the coastal regions of western Baffin Bay, while the 1965 census was made, and analyzed, on the assumption that all of western Baffin Bay at this time of the year, consisted of the Grand Banks berg potential. However, a comparison on a berg count alone, shows that 1966 will be an appreciably lighter ice year than 1965. When considering only the estimated bergs of both years and when the size of each count is compared, it is noted that in October 1965, 684 small bergs were observed up to Devon Island. In October 1964, only 465 small bergs were grouped into this size. Out of 3,425 bergs observed in 1964, 2,400 had no size estimated. In October 1965, 1,003 small bergs were observed throughout the entire area out of 2,340, with 680 unclassified as to size.

If the distribution by size is related to their position and the 680

unclassified bergs were distributed throughout the entire search area then approximately 1,408 bergs were small. While no similar deduction can be made about 1964, an approximation would show that 15 percent were small compared to 60 percent in 1965. The comparison between the 2 years in medium and large bergs shows the same trend of appreciably smaller size in the berg distribution.

2. December 1965.

The 1965 flight showed a berg crop of approximately the same number of bergs as the preceding year, or 406 to 422. However, the northern portion of the flight covered only up to 70° N. and not to Cape Christian. If it can be assumed that the observed berg distribution holds true for that specific period, then approximately 50 additional bergs would be distributed to Cape Christian. Distribution by size could be made on the distribution observed in the northern portion of the flight. Distribution by size of the unclassified bergs was made by comparison to the size distribution of the bergs observed within the areas described in the survey. With these assumptions a better comparison can be made with the December flights of 1964 and 1965 than with those flown in October. This reveals the following:

Area	Size 1964			Size 1965		
	Small	Medium	Large	Small	Medium	Large
South of Belle Isle	1	1	0	0	0	0
Belle Isle to 58° N.	8	4	1	0	0	0
58° N. to Cape Chidley	18	10	0	8	3	0
Hudson Straits to Loksland	18	23	12	12	4	3
Loksland to Cape Dyer	76	65	15	116	49	1
Cape Dyer to Cape Christian	98	82	20	107	60	2
Total	219	185	48	333	116	7

or that in 1964, out of a total of 452, bergs 49 percent were small and that in 1965, out of a total of 456, bergs 73 percent were small.

Some conclusions had been made in prior years on estimating the forthcoming year's berg crop south of latitude 48° N. on the basis of the distribution of bergs by numbers and size based on northern reconnaissance of Baffin Bay in October and December.

A comparison of 1964 and 1965, assuming; (1) that all bergs south of Cape Chidley by early December cannot last to the Grand Banks unless the pack ice drifts south with them; and, (2) all bergs north of Devon Island have too far to travel to make the Grand Banks by July shows the following existing berg distribution:

	Small	Medium	Large	Unclassified	Total
October 1964	465	443	79		984
October 1965	684	328	199	440	1,651

However, the 1965 included a count of all bergs observed from the Canadian coast to mid-Baffin Bay, while 1964 included only those out to approximately 90 miles from the coast. Restriction to the narrower band along the cost would reduce the 1965 count by some 500 bergs. These would be predominantly the medium and large bergs. The greater part, or 684 out of approximately 1,150, would be small bergs. While the difference in count between the two flights precludes any direct comparison, it becomes obvious that small bergs predominated in 1965. On the basis of these flights and assuming that normal meteorological and climatological conditions to prevail through to June 1966, it appears that the 1966 ice season will have a somewhat lower berg count south of latitude 48° N., as greater attrition could be expected amongst the smaller bergs.

A comparison of the 1964–65 December flights has already been made and indicated a greater percentage of smaller bergs in 1965. In tabulated form, the observations made in 1963–65 for the area south of Cape Dyer show the following existing berg distribution.

	Small	Medium	Large	Total
December 1963	174	227	131	532
December 1964	121	103	28	252
December 1955	136	53	4	193

The bergs drifting south of latitude 48° N. in 1964 totaled 369; in 1965, 76. It is forecast that less than half of the 1965 number will drift onto the Grand Banks in 1966, again provided that normal conditions prevail. It is the definition of normal conditions that is somewhat tenuous, but it is defined as those climatological and meteorological conditions that determine an "average" ice season.

If an abnormally favorable climate for berg drift and survival to the Grand Banks prevails the number could be as high as 100; if the conditions are unfavorable, as few as 20 would survive.

THE CORRELATION BETWEEN WINTER FROST DEGREE DAYS OF SELECTED BAFFIN ISLAND-LABRADOR-NEWFOUNDLAND COASTAL STATIONS AND THE RELATIVE ICEBERG SEVERITY ON THE GRAND BANKS

The climatology prevailing over the paths traversed by bergs is of extreme importance in determination of environmental conditions. There are many factors which influence berg deterioration and survival enroute to the Grand Banks. These are, in part, the temperature of the air and water, the ice coverage both as to concentration and thickness, sea conditions, incoming radiation, bathymetric contours, and oceanic current circulation. Exclusion of the two latter considerations contains the berg survival parameters to essentially those which describe climatology. Due to the scarcity of data available in Baffin Bay and on the Labrador coast, any attempt to establish a

quantitive analysis of the parameters becomes difficult. Instead, the use of accumulated frost degree days of selected stations can be used to describe the general climatology of the area for an indication of ice formations, growth, and attainment of concentrations of field ice, and this measure is used to define, in a general consideration, the berg environmental conditions. Bulletin No. 50 of this series presents a fuller discussion on this subject matter.

Table 3 lists frost degree days accumulation for the winters 1956–65. Table 4 lists mean monthly frost degree days accumulations from October through 15 March.

A comparison of the 1964–65 accumulated frost degree days with the 1956–64 mean frost degree days for the stations from Cartwright north is indicative of a normal winter climate. The slightly warmer than normal indicator for St. Anthony can be correlated to the higher than normal air temperatures noted in Newfoundland and southern Labrador in late February and early March. While it is apparent that no direct correlation can be made using frost degree days alone to the average for 1956–65, there is an indication, provided by the years 1957, 1959 and 1964, that a greater than normal accumulation of frost degree days, particularly from Hopedale south, is required to provide the right environmental conditions. Another assumption that can be made is that the climatology of the area north of Resolution Island is such that little or no berg deterioration can be expected throughout November to March. Temperature throughout this area remains low enough throughout this period to preclude any noticeable berg deterioration that can be correlated to mean frost degree days. Even an appeciable reduction in frost degree days could still indicate well below freezing (below 23° F) temperatures.

THE EFFECT OF SELECTED MONTHLY MEAN SEA LEVEL ATMOSPHERIC PRESSURE DISTRIBUTION ON THE GRAND BANKS ICE SEASON

The study of the effect of mean surface wind, as indicated by the U.S. Weather Bureau monthly sea level atmospheric pressure charts, on the drift of bergs from Baffin Bay to the Grand Banks requires the additional knowledge of the distribution of bergs, both by size and location. Special northern ice reconnaissance flights are made to determine the berg distribution. As the area encompassed by the bergs is vast, and as the pressure distribution might vary considerably from the northern to the southern areas, the bergs that pose a potential threat to the Grand Banks from March to July have been divided into two groups. The first group includes those bergs located between Hudson Strait entrance to Cape Dyer in early November. The second group includes those bergs located between Cape Dyer and Bylot Island, also in early November. The successive monthly

Table 3. Frost degree days accumulation for selected Baffin Island, Labrador, and Newfoundland stations, September through 15 March—Winters of 1956 through 1965

Station	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	Average 1956–65
Clyde River	4,920	6,787	6,289	6,454	6,154	6,348	6,760	5,364	6,030	5,721	6,124
Resolution Island	2,324	4,197	3,032	3,321	3,019	3,480	Msg	3,899	4,489	4,141	3,445
Hopedale	1,891	3,429	1,821	3,007	2,207	3,005	2,531	2,938	2,912	2,849	2,640
Cartwright	1,488	3,034	1,458	2,764	1,611	2,614	2,067	2,225	2,504	2,249	2,280
St. Anthony	791	2,136	864	1,924	1,021	1,899	1,283	1,453	1,650	1,318	1,445
Number of bergs south of 48° N	80	931	1	693	253	115	121	25	369	76	266

Table 4. Mean monthly frost degree days accumulations for selected stations, October–March

Station	October		November		December		January		February		March (1-15)	
	Month	Total	Month	Total	Month	Total	Month	Total	Month	Total	Month	Total
Clyde River	392	392		1,367	1,139	2,506	1,422	3,938	1,179	5,117	604	5,721
Resolution Island	124	124		741	752	1,503	1,172	2,675	990	3,665	476	4,141
Hopedale	0	0	221	221	698	910	966	1,885	777	2,662	187	2,849
Cartwright	8	8		177	517	694	804	1,498	649	2,147	102	2,249
St. Anthony	0	0	80	80	314	394	479	873	407	1,280	38	1,318

NOTE: Number of years used to determine the means are unknown.

locations of the two groups of the berg crop can be assumed or estimated using any available northern berg survey observations and taking into account drift due to the current system and atmospheric pressure patterns.

Refer to Bulletin No. 50 of this series for a broader discussion on this subject.

Table 5 is statistical summary of the effect of mean surface winds. This effect, correlated with the number of bergs drifting south of latitude 48° N., is presented in Table 6.

The trend indicated in these tables is for a slightly unfavorable drift of bergs to the Grand Banks. Intensified local conditions that can rapidly destroy or permanently entrap bergs are of course masked by the averaging of the daily pressure observations used to compile the mean monthly surface pressure charts. It now appears that different weights must be assigned to the code to provide closer correlation with actual observations. Eventually, when sufficient observations have been made, an empirical formula derived from curve fitting may be inferred.

Table 5. Average monthly surface wind conditions for iceberg drift toward the Grand Banks; 1957–65 ice seasons (Based on U.S. Weather Bureau monthly mean sea level pressure distribution charts)

Month	1957		1958		1959		1960		1961		1962		1963		1964		1965	
	1st half berg crop	2d half berg crop	1st	2d	1st	2d	1st	2d	1st	2d	1st	2d	1st	2d	1st	2d	1st	2d
November	VF	VF	SF	N	VF	SF	F	SF	SF	N	SU	N	U	U	N	U	U	U
December	VF	VF	SF	SF	VF	F	VF	F	F	F	U	U	U	VU	N	U	U	U
January	VF	VF	F	SF	SU	SU	SU	SF	F	F	VF	N	N	VU	VF	VF	VF	
February	VF	F	U	U	VF	VF	U	N	VF	F	SF	F	F	SU	F	SF	N	U
March	N	U	U	U	VF	SF	SF	N	SU	SU	VU	VU	VF	U	VF	U		
April	VF	VF	VU	N	F	F	F	SF	SU	U	SF	U	U	U	VF	F	SU	N
May		VF		VU		F		N		U		N		N		VF		SU
June		VF		VU		N		VU		U		U		U		N		SU

CODE:
- F=Favorable. WEIGHT: +2
- U=Unfavorable. −2
- V=Very. ±3
- S= Slightly. ±1
- N=Neutral. 0

Table 6. Average monthly surface wind conditions for iceberg drift toward the Grand Banks and the resulting Grand Banks iceberg season—1957–65 (Months November–June)

Year	1st half berg crop	2d half berg crop	Average for period	Icebergs drifting South of 48° N
1957	VF	VF	VF	931
1958	SF	N	N	1
1959	F	SF+	F−	693
1960	N	SF−	SF−	253
1961	F	F−	F	115
1962	SF−	SF−	SF−	121
1963	SU	U+	U−	25
1964	F	SF	F−	369
1965	SF−	SU+	SU	76

Vessel Ice and Weather Reports

[By Country]

Vessel	Weather reports	Ice reports
BELGIUM		
SS *Breyggel*	2	
SS *Lindi*	9	
SS *Loveral*	3	
SS *Lukuga*	2	
SS *Rubens*	7	
CANADA		
SS *Assiniboine*		1
SS *Baffin*	2	
SS *Hump Gilbert*	1	
SS *John A. MacDonald*		1
SS *Labrador*	3	
SS *Provider*		1
CHECHOSLOVAKIA		
SS *Caribia*	1	
DENMARK		
SS *Christiansborg*	13	1
SS *Eckeroee*	2	
SS *Heering Christel*	3	
SS *Helga Dan*	28	
SS *Leda Maersk*	1	
SS *Lemnos*	2	
SS *Mallemukken*	1	
SS *Marchen*	1	
SS *Mette Maersk*	13	
SS *Ritva Dan*	20	4
SS *Sommaroe*	1	
SS *Varla Dan*	38	
SS *Vinland*	9	
FINLAND		
SS *Agneta*	4	
SS *Amra*	12	
SS *J. W. Paulin*	27	
SS *Rauni*	1	
SS *Sommaro*	2	3
SS *Verna Paulin*	9	2
FRANCE		
SS *Carimare*	1	
SS *Chicago*	10	
SS *Cleveland*	7	
SS *Commandant Bourdais*	16	3
SS *France*	43	
SS *Gravisia*	2	
SS *Jacques D'Angleja*	3	
SS *Jean L. D.*	30	
SS *Joliette*	18	
SS *Moyne Diberville*	1	
SS *Pentellina*	13	
SS *Philippe L. D.*	71	1
SS *Protet*	2	
SS *Schiaffino Freres*	4	1
SS *Stigmaria*	21	
SS *Tocansa*	1	
SS *Washington*	9	
SS *Winnipeg*	17	
FEDERAL REPUBLIC OF GERMANY		
SS *Alexandra Sartori*	1	1
SS *Alfred Theodor*	11	3
SS *Anna Katrin Fritzen*	7	

Vessel Ice and Weather Reports—Continued

[By Country]

Vessel	Weather reports	Ice reports	Vessel	Weather reports	Ice reports
FEDERAL REPUBLIC OF GERMANY			FEDERAL REPUBLIC OF GERMANY		
SS *Anni Nubel*	1	-----	SS *Spreestein*	2	-----
SS *Augsburg*	2	-----	SS *Stadt Emden*	3	-----
SS *Berkersheim*	21	-----	SS *Susanne Fritzen*	13	1
SS *Berlin*	82	-----	SS *Tannstein*	1	-----
SS *Billetal*	-----	1	SS *Transamerica*	2	-----
SS *Birkenstein*	9	-----	SS *Transcanada*	1	-----
SS *Bischofstein*	2	-----	SS *Transquebec*	2	-----
SS *Bochum*	10	-----	SS *Uranus*	16	1
SS *Brakersand*	12	1	SS *Vegesack*	5	-----
SS *Bremen*	4	-----	SS *Walter Herwig*	49	-----
SS *Brunsbuttel*	4	-----	SS *Weissenburg*	14	1
SS *Carl Julius*	39	-----	SS *Wesermunde*	3	-----
SS *Carl Trautwein*	7	1	SS *Walfgang Russ*	1	-----
SS *Catherine Sartori*	-----	1			
SS *Christiane Schulte*	1	1	GREECE		
SS *Cimbria*	3	1			
SS *Clemens Sartori*	-----	1	SS *Andromachi*	6	-----
SS *Constantia*	9	-----	SS *Arkadia*	9	3
SS *Crystal Sapphire*	1	-----	SS *Dona Katerina*	3	-----
SS *Elisabeth Schulte*	2	2	SS *Eleni S.*	2	-----
SS *Elsfleth*	1	-----	SS *Eurylachus*	6	-----
SS *Erato*	6	-----	SS *Kristina Tharden*	8	1
SS *Erlangen*	1	-----	SS *Paros*	1	-----
SS *Erwin Schroder*	3	-----	SS *Penelope*	2	-----
SS *Falkenstein*	4	-----	SS *Queen Frederica*	5	-----
SS *Ginnheim*	4	-----	SS *Theoris*	1	-----
SS *Hanseatic*	23	-----			
SS *Ilse Schulte*	-----	1	ICELAND		
SS *Illstein*	2	-----			
SS *Johannes*	-----	1	SS *Bruarfoss*	6	-----
SS *Juliane Schroeder*	-----	1	SS *Hofsjokull*	18	1
SS *Klaus Oldendorff*	3	-----	SS *Lagarfoss*	2	1
SS *Lahnstein*	1	-----			
SS *Leada*	4	-----	INDIA		
SS *Leanina*	2	-----			
SS *Leapaul*	6	-----	SS *Indian Trader*	14	-----
SS *Mansfeld*	1	1	SS *Jaladurga*	4	-----
SS *Margarethe Bolten*	8	-----			
SS *Marie Leonhardt*	7	-----	IRELAND		
SS *Nienburg*	2	-----			
SS *Poseidon*	1	1	SS *Irish Cedar*	1	1
SS *Praunheim*	-----	1	SS *Irish Maple*	12	-----
SS *Rheinstein*	-----	2	SS *Irish Oak*	4	1
SS *Saarstein*	8	1	SS *Irish Pine*	1	-----
SS *Schwanheim*	40	-----	SS *Irish Willow*	2	1

[By Country]

Vessel	Weather reports	Ice reports
ISRAEL		
SS *Arad*	1	
SS *Etrog*	21	
SS *Hadar*	10	
SS *Har Canaan*	4	
SS *Netanya*	6	1
SS *Nogah*	15	
SS *Rimon*		1
SS *Shalom*	5	
ITALY		
SS *Angelo Scinicariello*	13	1
SS *Anna-C*	2	
SS *Aurelia*	8	
SS *Capo Noli*	11	
SS *Leonardo Da Vinci*	8	
SS *Paola Costa*	2	
SS *Rossini*	1	
SS *Saturnia*	2	
SS *Vulcania*	13	
SS *Zinobia Martini*	3	
JAPAN		
SS *Buenos Aires Maru*	12	3
SS *Hamburg Maru*	6	
SS *Yamakiyo Maru*	11	1
SS *Yoshinsan Maru*	1	
LEBANON		
SS *Henriette*		1
LIBERIA		
SS *Atholl McBean*		1
SS *Defiant*	1	
SS *Elizabeth Cogaty*	1	
SS *Elizabeth Conway*	3	
SS *Enterprise*	4	
SS *George A. Davidson*	5	
SS *Jamaica Producer*	1	
SS *Macareo*		1
SS *Ore Titan*		1
SS *Pegasus*	1	1
SS *Petro Queen*	1	
SS *Split*	1	
SS *White River*	1	
NETHERLANDS		
SS *Acila*	1	
SS *Alblasserdyk*	15	
SS *Smidiske*	15	1
SS *Anco Spray*	1	
SS *Asterope*	32	
SS *Baarn*	4	
SS *Bengkalis*	26	
SS *Bintang*	4	
SS *Breda*	2	
SS *Carrillo*	1	
SS *Ceres*	1	
SS *Colytto*	15	
SS *Drente*	1	
SS *Esso Amsterdam*	1	
SS *Grebbedyk*	1	
SS *Gorredyk*	6	
SS *Grotedyk*	16	
SS *Hermes*	1	
SS *Kaisedyk*	14	
SS *Kamperdyk*	17	
SS *Karakorum*	1	
SS *Kerkedyk*	50	
SS *Khasiella*	2	
SS *Kinderdyk*	11	
SS *Kloosterdyk*	5	
SS *Korendyk*	9	
SS *Lppersum*	2	
SS *Maasdam*	51	
SS *Meerdrecht*	1	1
SS *Neder Elbe*	1	
SS *Neder Weser*	2	
SS *Nieuw Amsterdam*	19	
SS *Ossendrecht*	10	1
SS *Poolster*	6	
SS *Prinses Margriet*	2	
SS *Prins Willem*	1	1
SS *Rotterdam*	12	
SS *Ryndam*	87	4
SS *Schiedyk*	19	

Vessel Ice and Weather Reports—Continued

[By Country]

Vessel	Weather reports	Ice reports
NETHERLANDS		
SS *Sirrah*	1	-----
SS *Sliedrecht*	1	-----
SS *Sloterdyk*	8	-----
SS *Socrates*	1	-----
SS *Soestdyk*	20	-----
SS *Sommelsdyk*	4	-----
SS *Statendam*	46	-----
SS *Tahama*	12	-----
SS *Thuredrecht*	12	-----
SS *Utrecht*	31	-----
NORWAY		
SS *Bergensfjord*	10	1
SS *Black*	6	-----
SS *Borealis*	23	-----
SS *Bow Plate*	16	-----
SS *Bralinda*	------	1
SS *Dianet*	15	1
SS *Evje*	1	-----
SS *Ferder*	16	-----
SS *Foldenfjord*	3	1
SS *Fro*	2	-----
SS *Froi*	1	-----
SS *Gerwi*	1	-----
SS *Havjo*	2	-----
SS *Havmoy*	1	-----
SS *Hiram*	14	-----
SS *Iris*	8	2
SS *Jarita*	10	-----
SS *Lind*	------	1
SS *Lunderjell*	1	1
SS *Oslofjord*	54	2
SS *Ronaecastle*	1	-----
SS *Rugdefjell*	1	-----
SS *Sandviken*	12	-----
SS *Suderoy VII*	1	-----
SS *Thorscarrier*	4	-----
SS *Thorsriver*	19	-----
SS *Topdalsfjord*	17	1
SS *Vikara*	16	1
SS *Vinstra*	3	
PANAMA		3
SS *Aristagelos*	------	1
SS *Beaver Dam*	1	-----
SS *Imperial St. Lawrence*	1	-----

Vessel	Weather reports	Ice reports
POLAND		
SS *Batory*	13	2
SS *Heweliusz*	1	-----
SS *Kapitan M. Stankiewicz*	2	-----
SS *Sienkiewicz*	14	-----
SS *Snidneki*	3	-----
PORTUGAL		
SS *Alenquer*	1	-----
SS *Arraiolos*	2	-----
SS *Bornes*	4	-----
SS *Gil Eannes*	39	-----
SS *Rigel*	2	-----
SOVIET UNION		
SS *Kueda*	30	-----
(Following Radio Call Signs Only)		
UDSU	2	-----
UEIX	2	-----
UJGZ	1	-----
UJMG	1	-----
UJOL	38	-----
UNSU	5	-----
UOQN	1	-----
UUKD	9	-----
UYUC	2	-----
SWEDEN		
SS *Adak*	13	-----
SS *Arjeplog*	1	-----
SS *Arvidsjaur*	89	-----
SS *Aurivaara*	7	-----
SS *Avafors*	39	-----
SS *Braheholm*	7	-----
SS *Brahehus*	5	-----
SS *Canadia*	------	1
SS *Cayman*	------	1
SS *Broriver*	------	1
SS *Falstaff*	------	1
SS *Floria*	1	-----
SS *Fredrik Ragne*	27	-----
SS *Gripsholm*	21	-----
SS *Joh Gorthon*	2	-----

Vessel Ice and Weather Reports—Continued

[By Country]

Vessel	Weather reports	Ice reports	Vessel	Weather reports	Ice reports
			UNITED KINGDOM—con.		
SS *Krageplim*		1	SS *British Oak*	18	1
SS *Kungsholm*	1		SS *British Sailor*	13	
SS *Laponia*	7		SS *Cairndhu*	1	
SS *Maj Range*	4	1	SS *Cairnesk*	2	1
SS *Mattawunga*	5		SS *Cairnforth*	2	
SS *Minnesota*	18		SS *Cairngowan*	24	3
SS *Nordica*	15		SS *Camellia*	9	
SS *Odensholm*	7		SS *Cape Nelson*	1	
SS *Segero*	15	1	SS *Carinthia*	65	2
SS *Sparreholm*	1		SS *Carmania*		2
SS *Tidaholm*	8		SS *Carrigan Head*	20	
SS *Vasaholm*	9		SS *Caxton*		2
SS *Vaxholm*	7	1	SS *City of Brooklyn*	14	
			SS *City of Gloucester*	22	
SWITZERLAND			SS *City of Sydney*		1
			SS *Clarkavon*	9	4
SS *Regina*	8		SS *Colina*	49	2
			SS *Craigallian*	10	2
TURKEY			SS *Crinan*	20	
			SS *Crystal Bell*	10	
SS *Namik Kemal*	1		SS *Crystal Jewel*	1	
			SS *Crystal Sapphire*	6	
UNITED ARAB REPUBLIC			SS *Cyrus Field*	18	2
			SS *Droxford*	16	
SS *Cayman*		1	SS *Duneraig*	1	
			SS *Dunkyle*		1
UNITED KINGDOM			SS *Emerillion*		1
			SS *Empress of Canada*	27	4
SS *Aeraigallian*	6		SS *Empress of England*	31	6
SS *Alaunia*	42		SS *Esso Oxford*	1	
SS *Alert*	3	1	SS *Fair Head*	12	
SS *Alice Bowater*	1	1	SS *Franconia*	25	1
SS *Andania*	7		SS *Geestport*	2	
SS *Aragona*	1	1	SS *Gladys Bowater*	1	3
SS *Arcadian*	25	6	SS *Glenmoor*	1	
SS *Athelcrest*	1		SS *Gloucester City*	21	1
SS *Bamburgh Castle*	2		SS *Gloxinia*	4	2
SS *Barlby*	1	2	SS *Glynafon*	10	
SS *Bassano*	28		SS *Gosforth*	2	1
SS *Beaver Ash*	42	4	SS *Gothland*	2	2
SS *Beaver Elm*	11	1	SS *Gypsum Countess*	1	
SS *Beaver Fir*	13	2	SS *Halifax City*	31	
SS *Beaver Pine*	12	1	SS *Harpagus*	9	
SS *Birdwood*	2	1	SS *Hemisphere*	1	
SS *Bristol City*	9		SS *Inverewe*		2
SS *British Guardian*	34		SS *Ivernia*	56	

Vessel Ice and Weather Reports—Continued

[By Country]

Vessel	Weather reports	Ice reports
UNITED KINGDOM—con.		
SS *Joya McCance*	40	1
SS *Lacolina*	22	-----
SS *Laurentia*	38	1
SS *Letitia*	11	1
SS *Lismoria*	42	1
SS *Longstone*	15	3
SS *Lycia*	4	-----
SS *Maidan*	1	-----
SS *Manchester Commerce*	26	5
SS *Manchester Exporter*	1	-----
SS *Manchester Faith*	1	-----
SS *Manchester Freighter*	1	1
SS *Manchester Mariner*	2	1
SS *Manchester Merchant*	1	1
SS *Manchester Miller*	8	2
SS *Monchester Regiment*	4	-----
SS *Manchester Shipper*	3	-----
SS *Manchester Spinner*	49	1
SS *Manchester Trader*	2	-----
SS *Marengo*	1	2
SS *Media*	51	-----
SS *Montreal City*	31	2
SS *Naess Pioneer*	-----	1
SS *Newfoundland*	27	-----
SS *New York City*	19	-----
SS *Nova Scotia*	4	1
SS *Oakmore*	3	-----
SS *Oregis*	10	-----
SS *Oremina*	-----	3
SS *Otterburn*	7	-----
SS *Overseas Courier*	18	-----
SS *Pacific Envoy*	1	-----
SS *Parthia*	14	1
SS *Phrygia*	6	-----
SS *Phyllis Bowater*	8	1
SS *Ramore Head*	1	-----
SS *Rathland Head*	5	1
SS *Ravensworth*	5	-----
SS *Rialto*	18	-----
SS *Roonagh Head*	4	-----
SS *Ruahine*	1	-----
SS *Saldura*	10	-----
SS *Salemla*	2	1
SS *Salvada*	-----	2
SS *Samaria*	20	-----
SS *Santona*	-----	1
SS *Sarah Bowater*	2	2
SS *Saxonia*	26	-----
SS *Scottish Trader*	1	-----
SS *Scythia*	32	-----
SS *Sheaf Field*	-----	1
SS *Sidonia*	4	-----
SS *Silverbeach*	13	-----
SS *Silvercrag*	18	2
SS *Silversand*	22	-----
SS *Silksworth*	3	-----
SS *Simonburn*	3	1
SS *Sneaton*	11	-----
SS *Sugar Producer*	1	-----
SS *Sugar Refiner*	1	-----
SS *Sylvania*	81	-----
SS *Tenby*	4	1
SS *Tilapa*	9	-----
SS *Torr Head*	3	-----
SS *Trebartha*	9	-----
SS *Trecarrell*	11	-----
SS *Treneglos*	17	-----
SS *Trinculo*	20	-----
SS *Uskport*	1	-----
SS *Winchester King*	13	-----
UNITED STATES		
SS *American Builder*	44	-----
SS *American Champion*	4	-----
SS *Americn Charger*	27	-----
SS *American Chieftan*	3	-----
SS *American Clipper*	2	-----
SS *American Contender*	7	-----
SS *American Contractor*	1	-----
SS *American Corsair*	8	-----
SS *American Crusader*	29	-----
SS *American Forester*	5	-----
SS *American Forwarder*	36	-----
SS *American Importer*	15	4
SS *American Leader*	13	-----
SS *American Manufacturer*	42	-----
SS *American Merchant*	3	-----
SS *American Packer*	15	-----
SS *American Pilot*	18	-----
SS *American Press*	8	-----

[By Country]

Vessel	Weather reports	Ice reports	Vessel	Weather reports	Ice reports
UNITED STATES—con.			UNITED STATES—con.		
SS *American Racer*	7	-----	SS *Madaket*	4	-----
SS *American Ranger*	1	-----	SS *Mormacaltair*	1	-----
SS *American Reporter*	52	1	SS *Mormacargo*	4	-----
SS *American Rover*	19	-----	SS *Mormacdawn*	2	-----
SS *American Scientist*	21	-----	SS *Mormaclynx*	3	-----
SS *American Scout*	22	-----	SS *Mormacpenn*	29	-----
SS *American Shipper*	9	-----	SS *Mormacpride*	1	-----
SS *American Traveler*	14	-----	SS *Mormacrigel*	8	-----
SS *American Veteran*	3	-----	SS *Mormactrade*	5	-----
SS *Anne Quinn*	6	-----	SS *Mormacvega*	5	-----
SS *Atlantic*	1	-----	SS *Newberry Victory*	1	-----
SS *Attleboro Victory*	1	-----	SS *Overseas Joyce*	2	-----
SS *Bayou State*	10	-----	SS *Panoceanic Faith*	1	-----
SS *Biddeford Victory*	1	-----	SS *Pioneer Cove*	18	-----
SS *Brazil*	7	-----	SS *Pioneer Glen*	6	-----
SS *Charles Lykes*	1	-----	SS *Pioneer Moon*	23	-----
SS *City of Alma*	4	-----	SS *Pioneer Tide*	1	-----
SS *Consolidation Coal*	11	-----	SS *Remsen Heights*	1	-----
SS *Del Oro*	1	-----	SS *San Angelo Victory*	2	-----
SS *Exbrook*	2	-----	SS *Santa Leonoe*	1	-----
SS *Excelsior*	1	-----	SS *Sir John Franklin*	4	-----
SS *Executor*	10	-----	SS *Steel Admiral*	2	-----
SS *Exiria*	1	-----	SS *Steel Architech*	1	-----
SS *Exminister*	2	-----	SS *Steel Designer*	2	-----
SS *Expeditor*	8	-----	SS *Steel Recorder*	4	-----
SS *Export Adventurer*	2	-----	SS *Steel Surveyor*	2	-----
SS *Export Bay*	1	-----	SS *Steel Vendor*	3	-----
SS *Export Champion*	5	-----	SS *Transglobe*	9	-----
SS *Export Commerce*	2	-----	SS *Tyson Lykes*	1	-----
SS *Exporter*	1	-----	SS *Ulua*	1	-----
SS *Extavia*	8	-----	SS *United States*	6	-----
SS *Flying Clipper*	2	-----	SS *Vicksburg*	1	-----
SS *Flying Enterprise*	1	-----	SS *Wolverine State*	30	1
SS *Flying Independence*	7	-----	SS *Zoella Lykes*	1	-----
SS *Flying Spray*	8	-----			
SS *Flying Trader*	1	-----	U.S. MILITARY SEA TRANSPORTATION SERVICE		
SS *Geneva*	1	2			
SS *Globe Progress*	17	-----			
SS *Green Dale*	1	-----	USNS *Bondia*	12	3
SS *Green Wave*	1	-----	USNS *Cache*	6	-----
SS *Hoosier State*	7	-----	USNS *Comet*	15	-----
SS *Hurricane*	1	1	USNS *Cowanesque*	1	-----
SS *Independence*	1	-----	USNS *Gen. Alexander M. Patch*	47	-----
SS *John B. Waterman*	1	-----			
SS *Junior*	3	-----	USNS *Gen. Maurice Tose*	63	-----
SS *Keystone State*	6	-----			

Vessel Ice and Weather Reports—Continued

[By Country]

Vessel	Weather reports	Ice reports
U.S. MILITARY SEA TRANSPORTATION SERVICE—continued		
USNS *Gen. Simon B. Buckner*	92	-----
USNS *Geiger*	50	-----
USNS *General William O. Darby*	60	-----
USNS *Mirfak*	23	8
USNS *Norwalk*	31	1
USNS *Rose*	3	-----
USNS *Sgt. J. E. Kelly*	10	2
USNS *Short Splice*	1	-----
USNS *Tallulah*	1	-----
USNS *Taurus*	48	-----
USNS *Upshur*	80	-----
U.S. NAVY		
USS *Mills*	11	-----
U.S. COAST GUARD		
USCGC *Absecon*	8	-----
USCGC *Barataria*	25	-----
U.S. COAST GUARD—con.		
USCGC *Bibb*	8	-----
USCGC *Campbell*	39	1
USCGC *Castle Rock*	45	5
USCGC *Evergreen*	295	10
USCGC *Halfmoon*	1	-----
USCGC *Humboldt*	9	-----
USCGC *McCulloch*	29	4
USCGC *Mendota*	4	-----
USCGC *Sebago*	1	-----
USCGC *Spencer*	62	2
USCGC *Yakutat*	33	2
YUGOSLAVIA		
SS *Baska*	1	-----
SS *Bela Krajina*	7	1
SS *Grobnik*	10	-----
SS *Lika Botic*	-----	1
SS *Ljubija*	9	-----
SS *Natko Nodilo*	4	1
SS *Piran*	1	-----
SS *Rog*	21	-----
SS *Zenica*	2	-----

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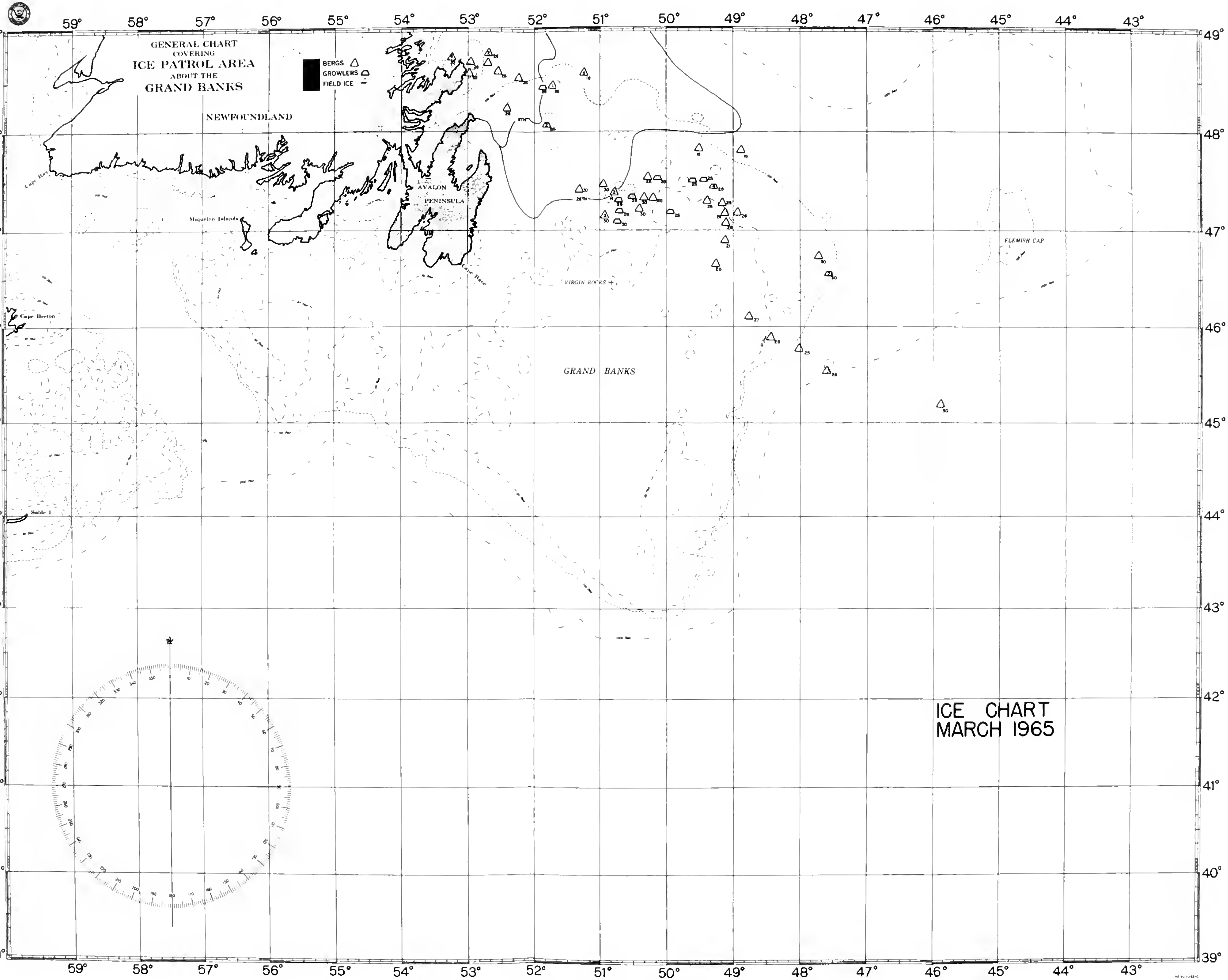

FIGURE 21.—Ice chart—Grand Banks, March 1965.

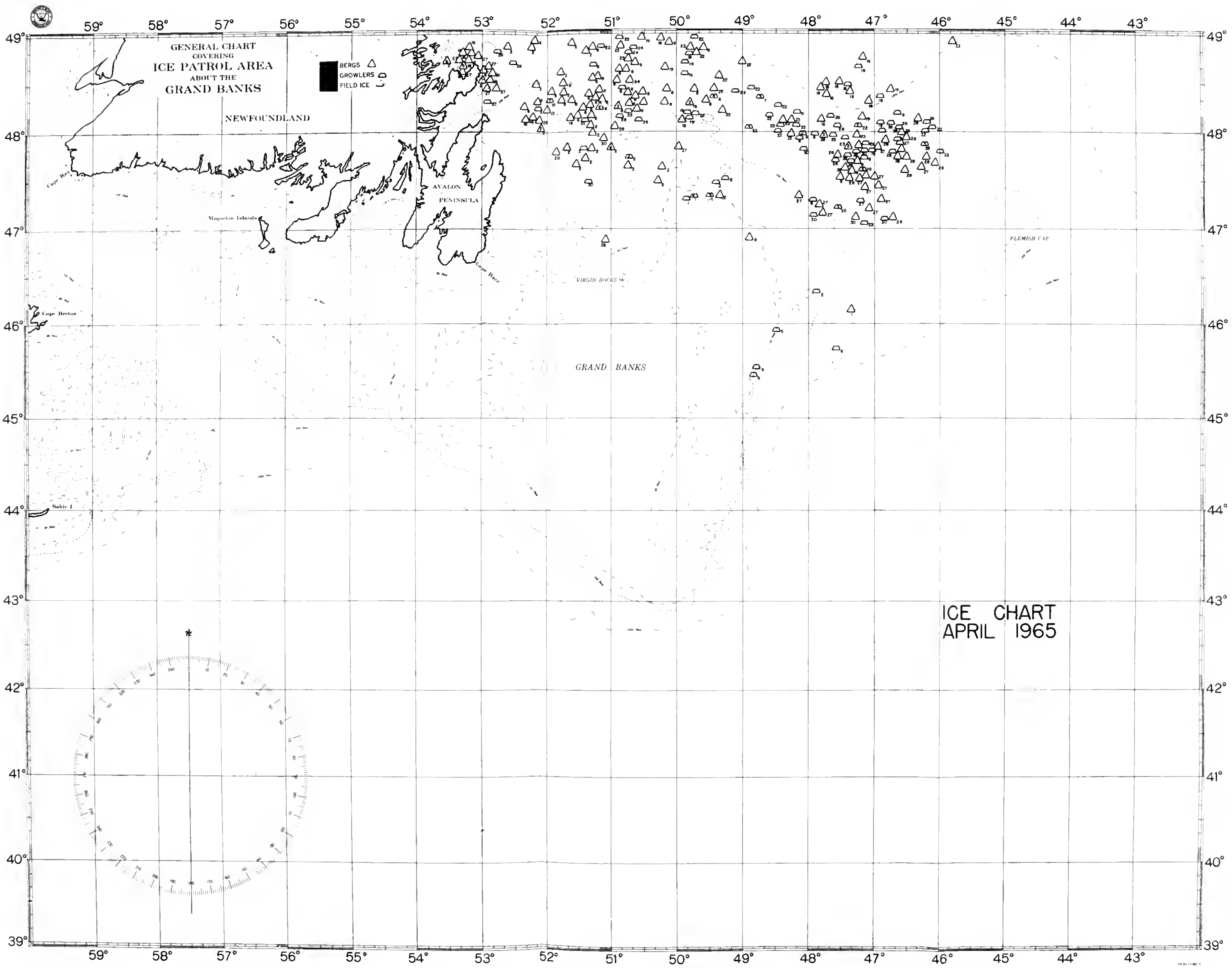

FIGURE 22.—Ice chart—Grand Banks, April 1965.

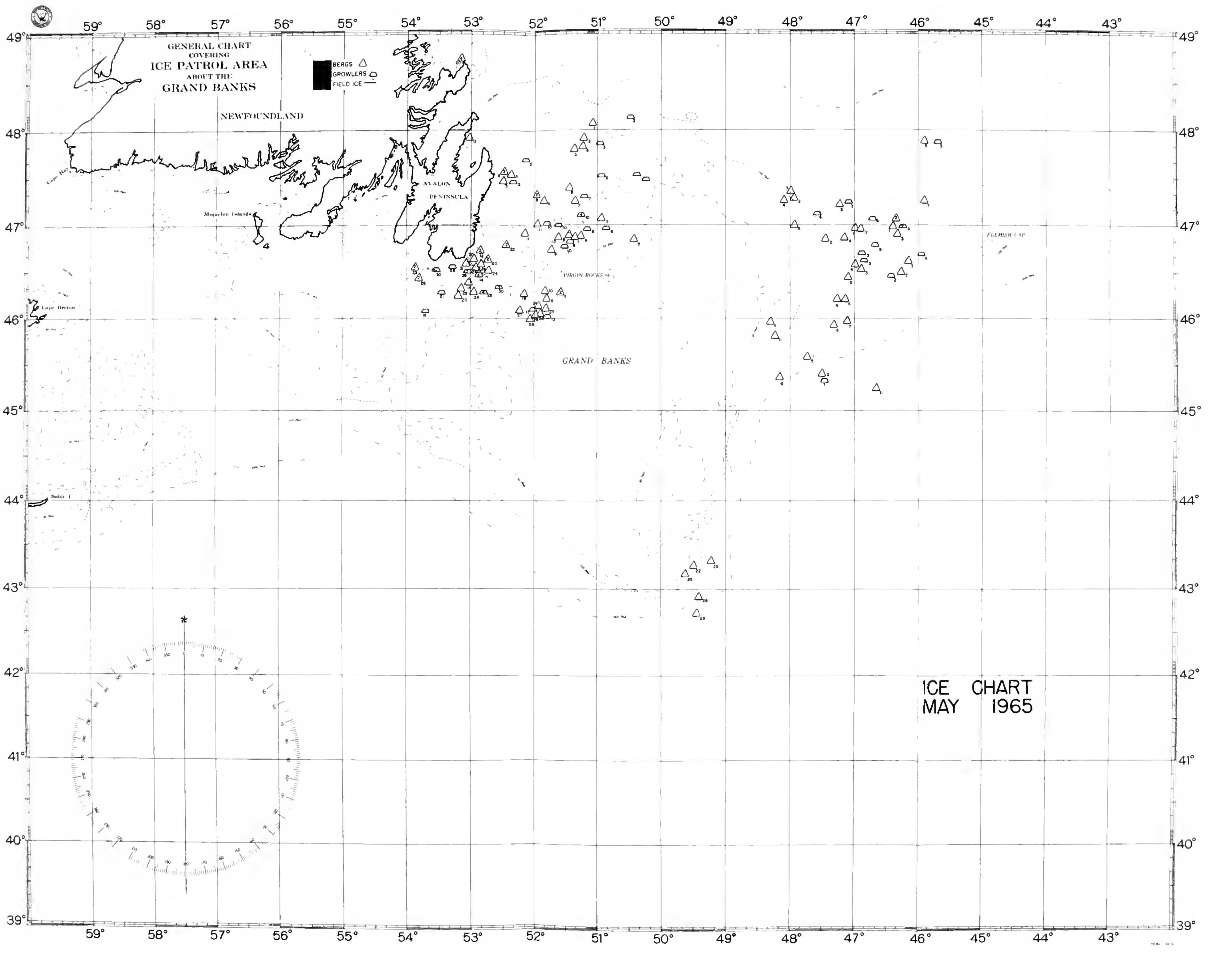

FIGURE 23.—Ice chart—Grand Banks, May 1965.

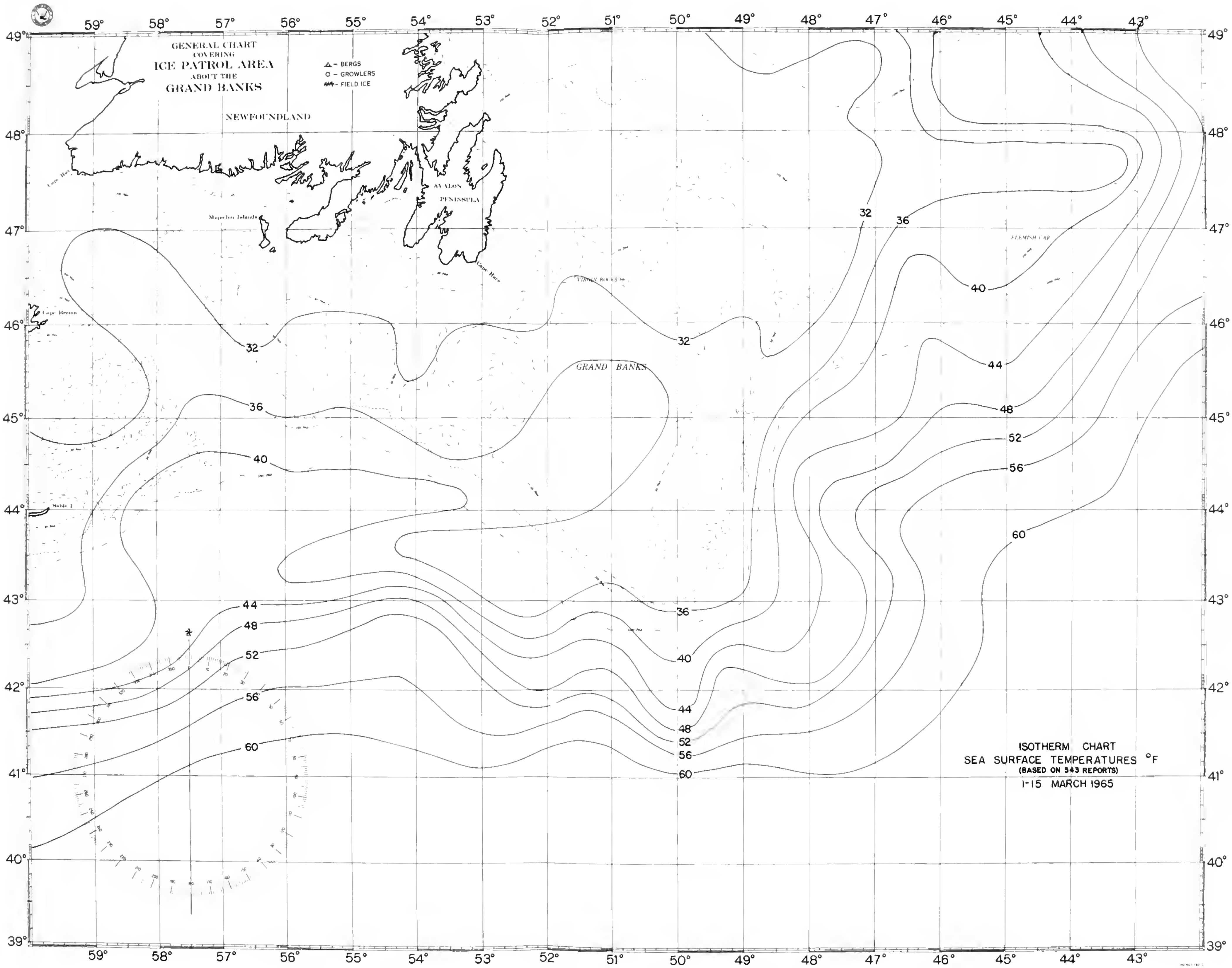

FIGURE 24.—Sea surface isotherms, 1–15 March 1965.

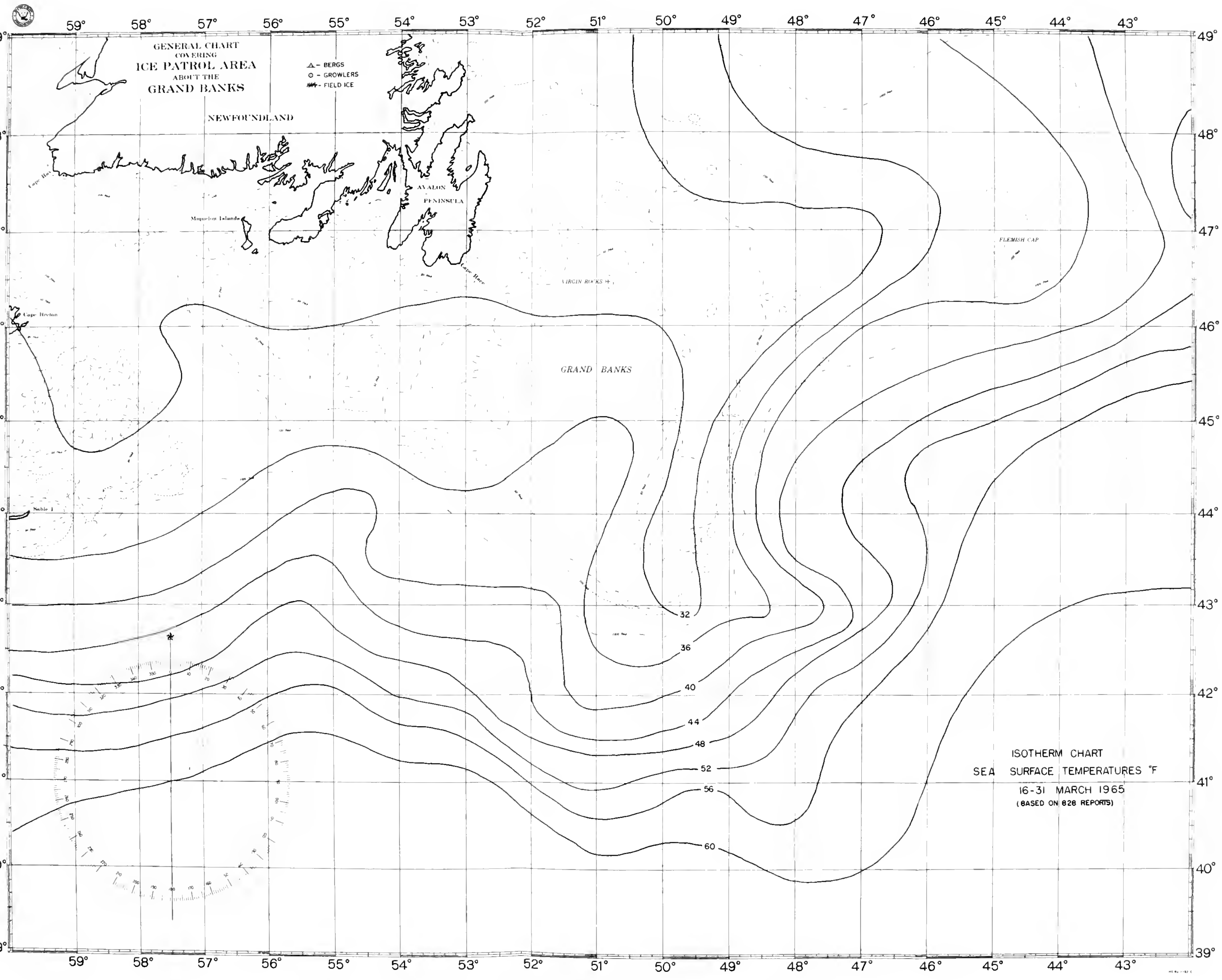

FIGURE 25.—Sea surface isotherms, 16–31 March 1965.

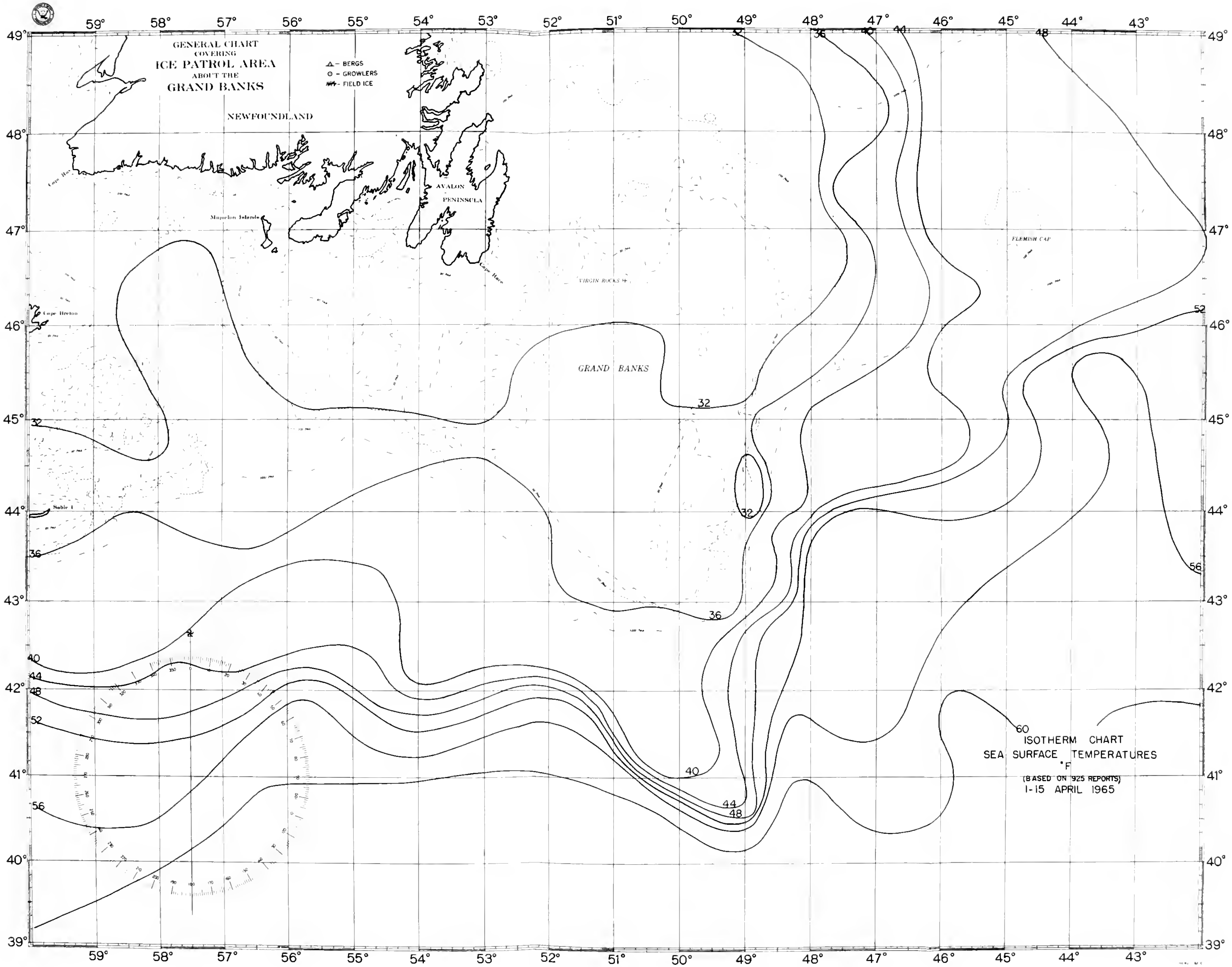

FIGURE 26.—Sea surface isotherms, 1–15 April 1965.

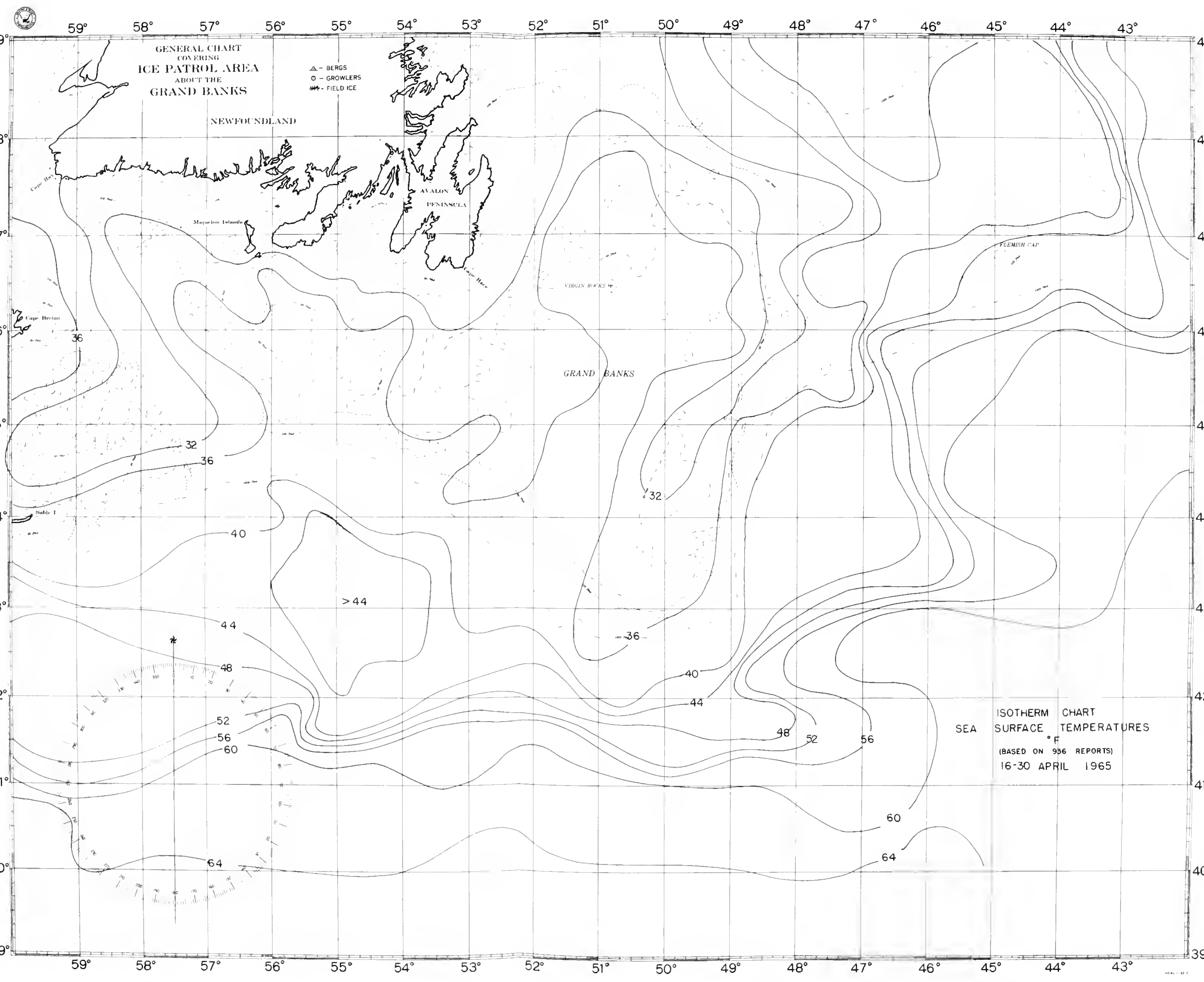

FIGURE 27.—Sea surface isotherms, 16–30 April 1965.

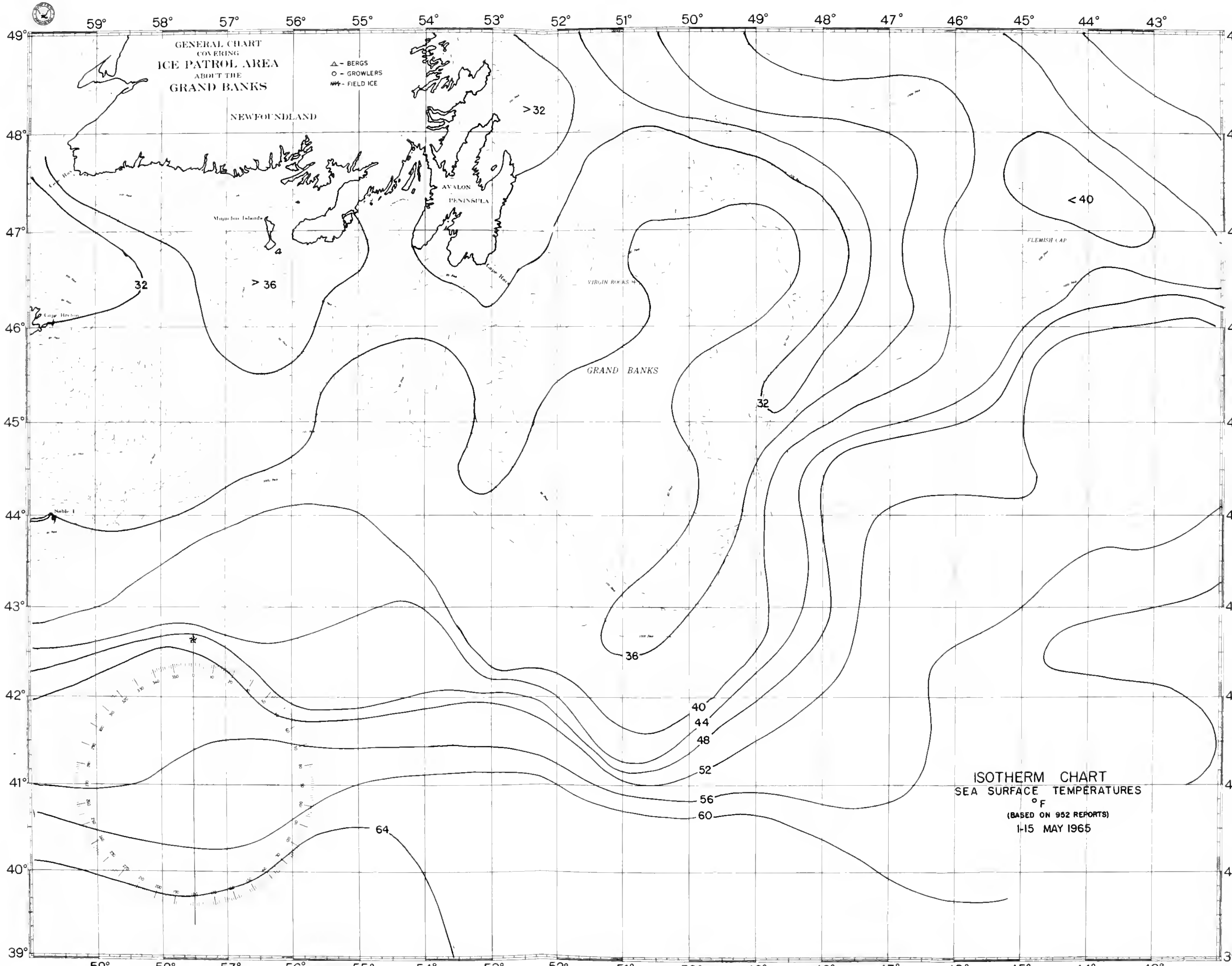

FIGURE 28.—Sea surface isotherms, 1–15 May 1965.

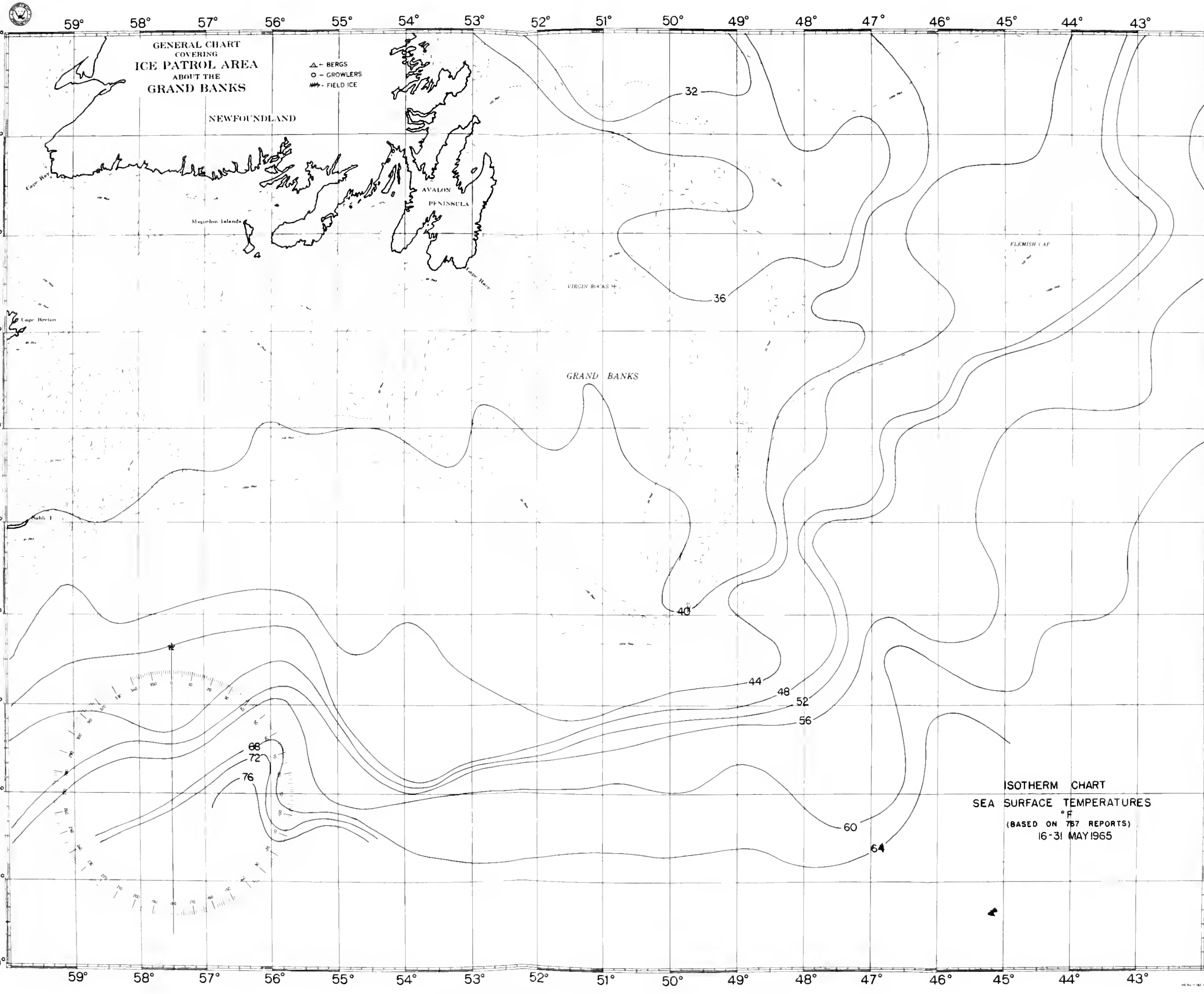

Figure 29.—Sea surface isotherms, 16–31 May 1965.

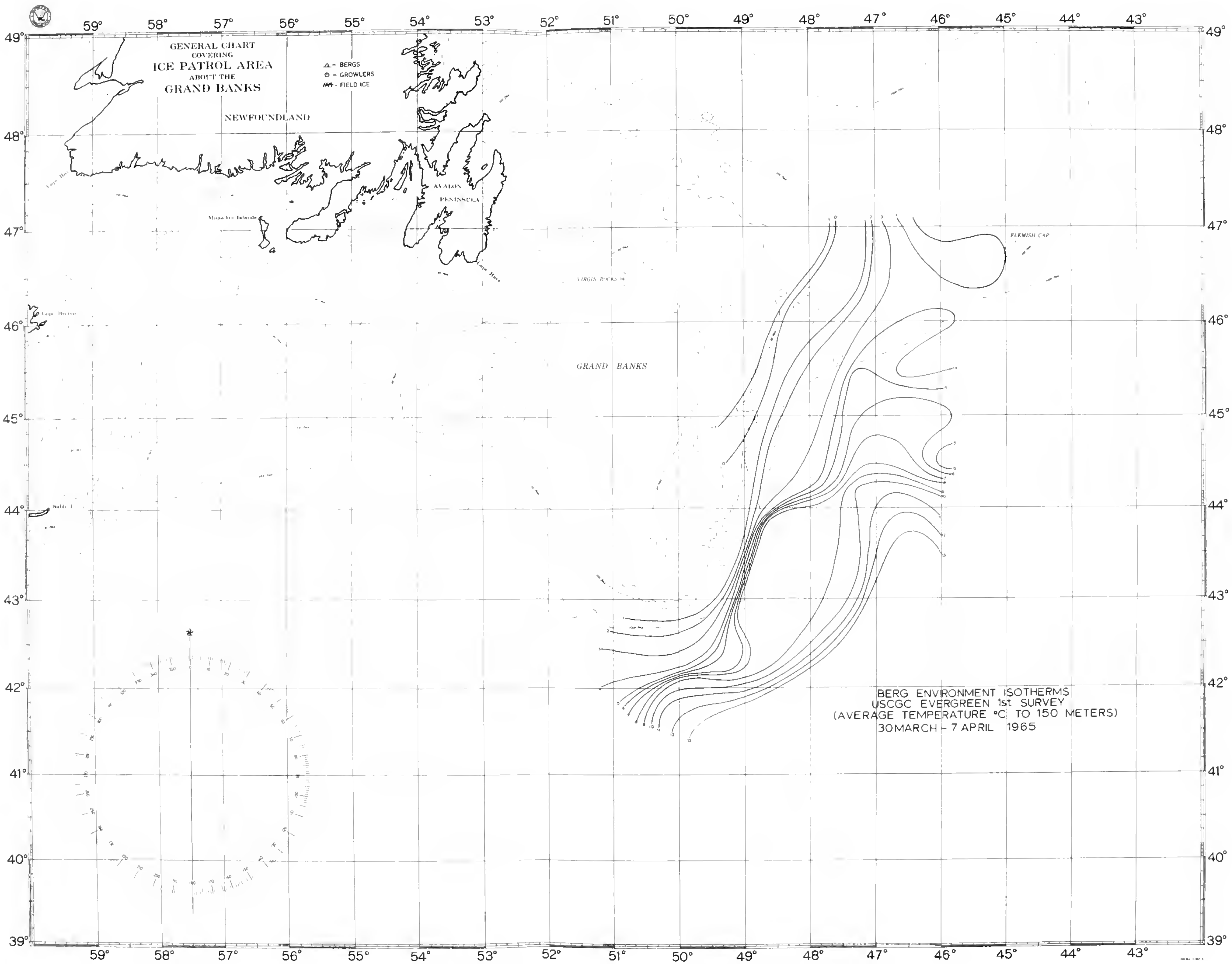

FIGURE 30.—Isotherms of average sea temperature, 0–150 meters, 30 March–9 April 1965.

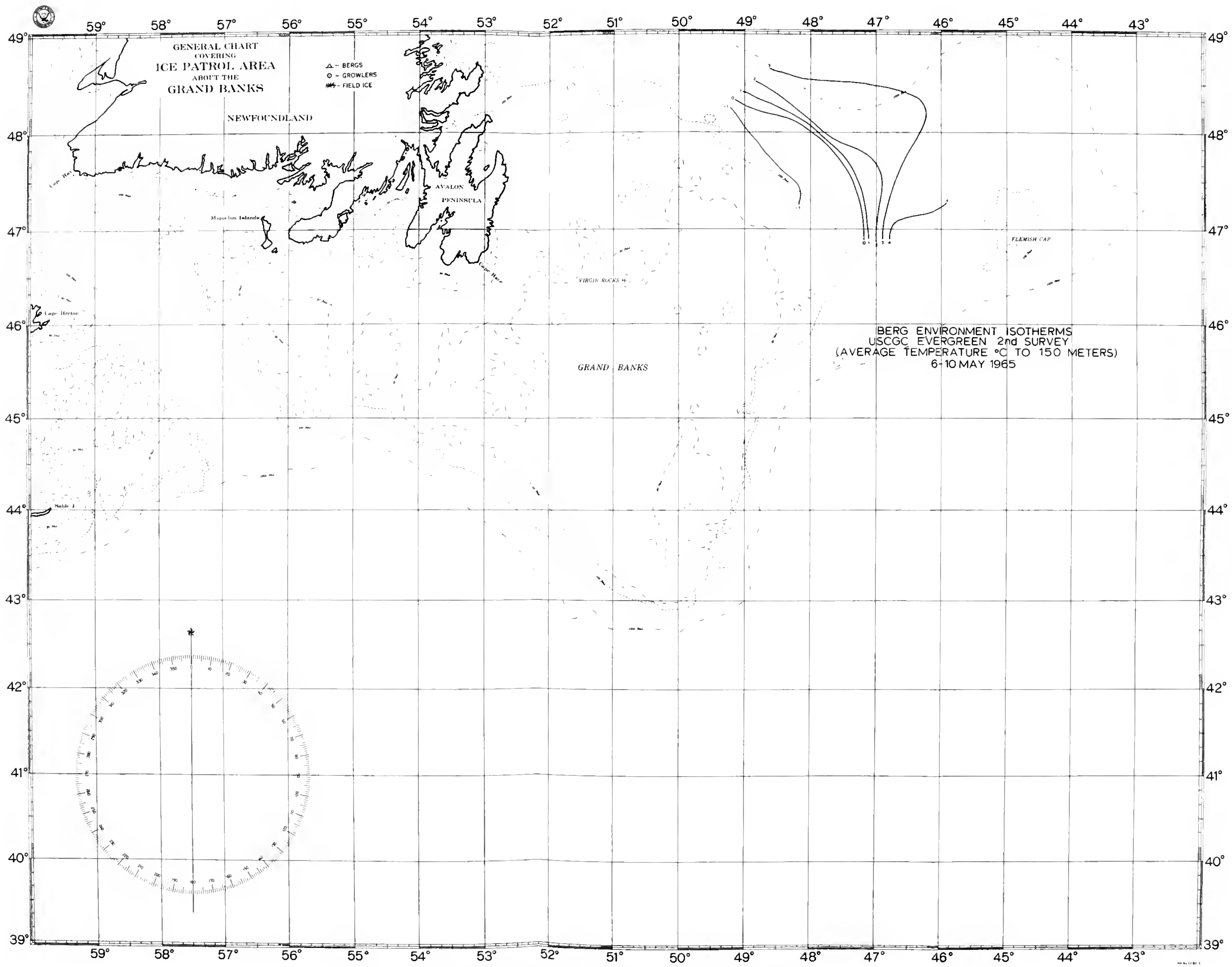

FIGURE 31.—Isotherms of average sea temperature, 0–150 meters, 6–10 May 1965.

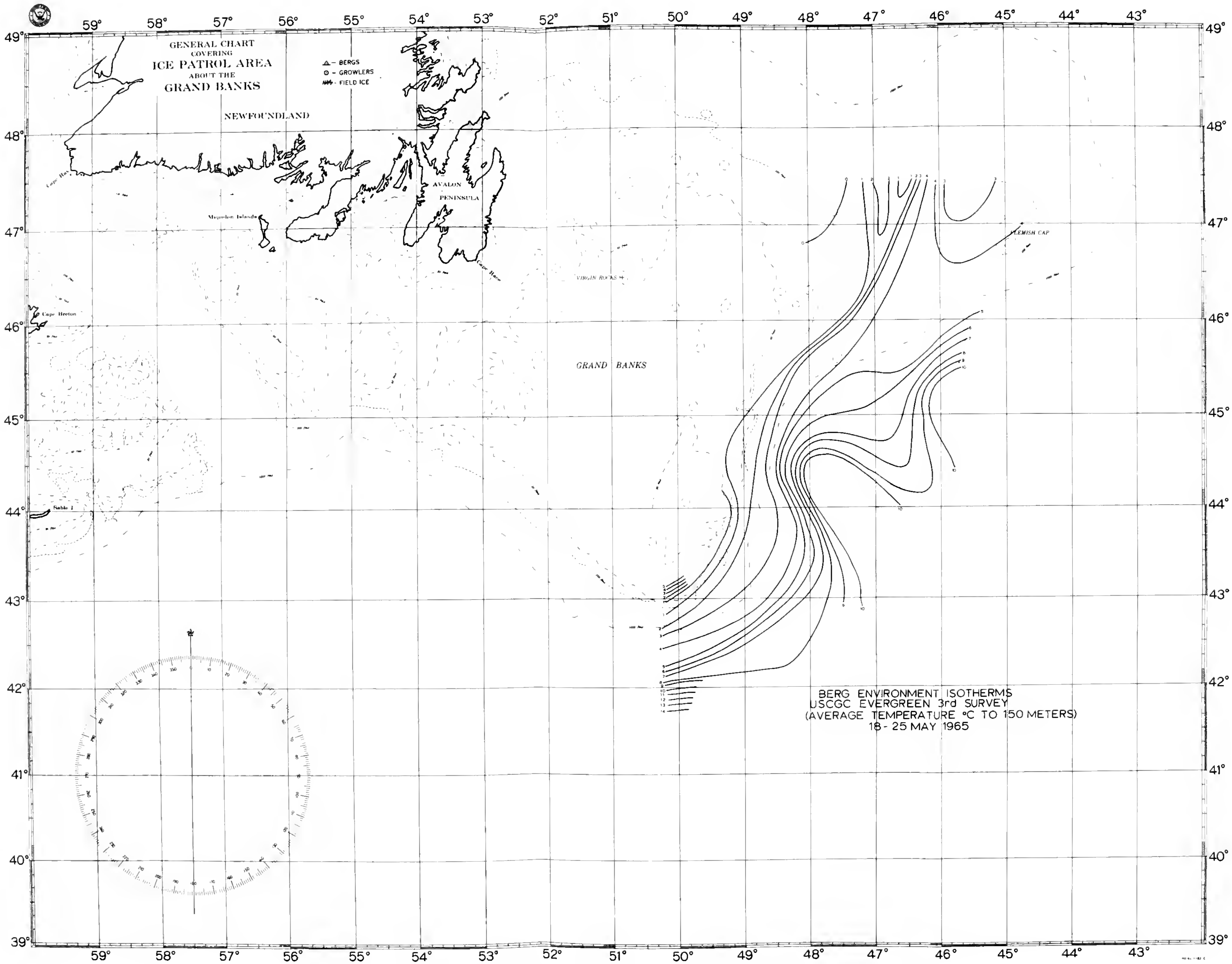

FIGURE 32.—Isotherms of average sea temperature, 0–150 meters, 18–25 May 1965.

COAST GUARD

BULLETIN No. 52

REPORT OF THE INTERNATIONAL ICE PATROL SERVICE

IN THE

NORTH ATLANTIC OCEAN

J. E. MURRAY

Season of 1966

CG-188-21

COAST GUARD

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CG-188- 21

DEPARTMENT OF TRANSPORTATION
UNITED STATES COAST GUARD

Address reply to
COMMANDANT (OMS)
U S COAST GUARD
WASHINGTON D C
20591

27 May 1969

Transmitted herewith is Bulletin No. 52, Report of the International Ice Patrol Service in the North Atlantic Ocean, season of 1966.

R. W. GOEHRING
Chief, Office of Operations

Dist: (SDL No. 88)
A : abcdefghmuv(1)
B : a(250); e(10); bcg(2); m(1)
C : abc(1)
D : s(35); h(10); gil(1)
E : None
F : None

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PREFACE

This bulletin is No. 52 in the series of annual reports on the International Ice Observations and Ice Patrol Services. The authority for the mission, forces assigned, and the method of operation of the International Ice Patrol are described.

Aerial ice observation and communication statistics are provided.

All ships reporting ice and weather to the International Ice Patrol in 1966 are tabulated. A month-by-month general description of ice conditions for the Grand Banks area is given. Not one berg drifted south of latitude 48° N. during the season. The duration and maximum extension of pack ice to the south and east of Newfoundland was subnormal.

Weather and climatology of Baffin Bay, Davis Strait, the Labrador Sea, and the exceptional conditions in the North Atlantic Ocean that influenced the ice conditions are presented.

Capt. Richard L. Fuller, U.S.C.G., was Commander, International Ice Patrol, as well as Commanding Officer, U.S.C.G. Air Station, Argentia, Newfoundland.

The author of this bulletin, Comdr. J. E. Murray, U.S.C.G., acknowledges meteorological data supplied by the Canadian Department of Transport, Ice Central, Halifax, Nova Scotia, the U.S. Navy Fleet Weather Facility, Argentia, Newfoundland, and the U.S. Naval Oceanographic Office.

Assisting in the preparation of the illustrations and manuscript were Chief Aerographer's Mate William F. Van Gaasbeck and Yeoman First Class Heber M. Kern.

Fig. 1.—Medium sized bergs in the Cape York/Cape Atholl Greenland area, September 1966.

INTERNATIONAL ICE PATROL

The International Ice Patrol Service for 1966 was carried out by the U.S. Coast Guard in accordance with the provisions of the International Convention on the Safety of Life at Sea, 1960 and the United States Code, Title 46, Sections 738–739d. The mission of protecting shipping from the dangers of ice drifting in the Grand Banks area was accomplished by the collection of ice information from all available sources and by means of twice daily radio broadcasts and daily facsimile broadcasts disseminating to shipping the description of the current ice situation.

The Commander, International Ice Patrol, Capt. R. L. Fuller, U.S.C.G., had the following facilities available to him during the ice season: The Office, International Ice Patrol staff; radio and landline communication facilities of the Coast Guard radio station NIK; Hercules HC–130B reconnaissance aircraft support provided by the U.S. Coast Guard Air Station, Argentia, Newfoundland; surface patrol vessels U.S. Coast Guard Cutter *Tamaroa*, U.S. Coast Guard Cutter *Chilula*, and U.S. Coast Guard Cutter *Acushnet*. The oceanographic vessel was the U.S. Coast Guard Cutter *Evergreen*. The distribution of ice made it unnecessary to initiate a surface patrol for the seventh consecutive year. This was the third and final year the Commander, International Ice Patrol was permanently stationed at Argentia, Newfoundland.

In addition to the assigned forces, the U.S. Coast Guard Oceanographic Unit edited N.E.S.C. ESSA I satellite photographs and transmitted the ice limits and concentrations to the Ice Patrol. A study, comparing ESSA I ice data with available observed data, was conducted. Good correlation was observed. The results, unpublished, were compiled by the U.S.C.G. Oceanographic Unit into a loose leaf presentation "The Operational Use of ESSA I Satellite Photography during the 1966 Season of the International Ice Patrol." Refer to figure 8 for one such comparative observation.

Preseason aerial ice reconnaissance indicated an extremely light ice season. The first of 13 ice observation flights made during the season was flown on 5 March. The twice-daily ice broadcasts to shipping were commenced at 1248 G.m.t., 1 March 1966. The first facsimile transmission was commenced at 1330 G.m.t., 1 March 1966. The ice information was also sent via landline to the U.S. Naval Oceanographic Office, the

Canadian Department of Transport, R.C.N. Radio Station, Albro Lake, Nova Scotia, and others for their information and for further dissemination.

The principle sources of ice information during the ice season were the ice observation flights made by the International Ice Patrol aircraft, reports made by commercial and military vessels, ice reconnaissance flights by the Canadian Department of Transport in the Gulf of St. Lawrence and Newfoundland coastal waters, by the U.S. Navy in the Labrador Sea and Baffin Bay, and other contributors. Merchant ship reports on weather and ice conditions were an indispensable source of information.

The operations of the International Ice Patrol from 1 March to 28 April can be summarized as follows:

1. Ice Patrol reconnaissance flights were flown for the main purpose of guarding the southeastern, southern, and southwestern limits of all ice on the Grand Banks.
2. Ice reports were collected from ships, aircraft, and other ice observing agencies.
3. Weather reports, including sea surface temperatures were collected from ships.
4. Ice information was plotted and analyzed.
5. Ice conditions were forecast twice daily during periods between observed ice conditions.
6. Ice advisory broadcasts were made twice daily to shipping and transmitted twice daily to interested agencies.
7. Facsimile transmissions were made once daily to shipping.
8. Special ice information was provided on request.
9. Position plots were maintained on all ships reporting in the Ice Patrol area.
10. Two oceanographic cruises were conducted between 29 March and 25 April 1966 to collect oceanographic data affecting the drift and deterioration of ice.

U.S.C.G. Cutter *Evergreen* made two oceanographic check surveys of standard sections in the critical areas of the Grand Banks area to measure the dynamic topography in order to determine the structure of the Labrador Current. A time-series occupation of the Labrador Current was also conducted. Due to the absence of bergs, no drift and deterioration study could be conducted.

The normal Ice Patrol routine was to estimate the set and drift and deterioration of bergs and field ice from the current maps prepared from oceanographic surveys, semimonthly isotherm charts prepared from sea temperatures reported by shipping and wind data supplied by the U.S. Navy Fleet Weather Facility at Argentia. With this data, a current 12 hourly plot on ice conditions is normally maintained and is used in planning ice reconnaissance flights and in issuing the radio

broadcasts. However, the absence of bergs on the Banks and the sparsity of pack ice precluded forecasting ice conditions.

The 47th International Ice Patrol was exceptional, marked by great variations from the predominant surface weather patterns, preceded by intensive hurricane force winds in the Newfoundland area and by a radical departure from the normal oceanographic regime. It was concluded as the shortest season on record without one iceberg having drifted south of latitude 48° N. The United States-European North Atlantic Track Agreement Tracks C and D were not shifted south as scheduled due to the absence of ice. Only strings of field ice drifted into Canadian-European Track F. Track E remained completely free of ice.

Track G was free of ice until mid-January and was open for the safe passage of shipping by early June. Bergs continued to persist in the Straits of Belle Isle until July. The steamer track from Cabot Strait to the St. Lawrence River ports was declared open on 15 April 1966.

Dissemination of ice information by the International Ice Patrol ceased on 28 April 1966. Periodic postseason ice reconnaissance flights were continued to guard against any stray berg reaching the tracks and were discontinued in June due to the utter absence of bergs to the north that could pose any threat to shipping. All ice reconnaissance flights were discontinued in June and the U.S. Coast Guard Air Station Argentia and the International Ict Patrol Argentia were disestablished. The International Ice Patrol was transferred to New York and resumed its operations. Aircraft were then deployed to Argentia from the U.S.C.G. Air Station Elizabeth City, N.C., as warranted. Berg census flights of western Baffin Bay were conducted in September and December.

The most significant factor contributing to the low presence of bergs north of the Grand Banks was the tracks of the low pressure systems during December 1965 and January 1966. It was observed that most low pressure systems were passing well south of their normal path. This placed them passing south of Newfoundland and approximately 600 to 900 nautical miles southeast of Greenland. The surface winds over the North Atlantic varied greatly from the norm with strong southeasterly winds predominant for these 2 months. These surface wind patterns over the mid-North Atlantic were distinctive enough to permit applying generalized applications of wind driven ocean circulation theories.

Theoretical considerations indicated a strong, wind-driven ocean circulation of warm water and mass transport of warm water from the eastern mid-North Atlantic northward. This warm water would develop a stronger than normal Irminger Current component, reinforce the West Greenland Current, and develop a shallow gyre of relative warm water in the Labrador Sea. Lateral mixing of this gyre with

the Labrador Current would appreciably warm the latter, thus destroying the classic identity of Labrador Current Water as defined by standard T–S diagrams. This was the case as observed during the 1966 Ice Patrol season. Higher than average sea temperatures were observed all over the Ice Patrol oceanic areas of interest during the Ice Patrol season. The U.S.C.G. Cutter *Evergreen's* oceanographic survey (refer to fig. 10) indicated an absence of any well-defined Labrador Current.

The width of the field ice off the Labrador coast was abnormally narrow during the late winter months. At Saglek, Labrador, there was a sharp change in the field ice depth along the coast (refer to figs. 2, 4, 7, 9, and 11). The assumption is made that the gyre of warm water, forecast to exist in the Labrador Sea, encountered the ice near Saglek and ice deterioration was nearly as rapid as the southern drift of the ice.

Another indication of the existence of much warmer water was the open lead of water existing along the west Greenland coast that opened very early in the spring as far north as Upernavik. Baffin Bay was entirely free of ice by September.

Other factors affecting the absence of bergs south of latitude 48° N. were the relatively low count and predominantly small size of bergs in Baffin Bay observed during the October and December 1965 berg census flights, the consistent onshore winds over Labrador coastal waters during most of the months preceding and during the ice season, the warmer than normal air temperatures, and the hurricane force winds of the 29th of January and the 15th of February 1966.

Northern ice observation flights from Argentia, Newfoundland, past Labrador and Baffin Bay to the area just south of Thule, Greenland, in October and December 1965 showed well less than normal iceberg supply. A comparison of the 1964 and 1965 iceberg census flights showed that 49 percent of the observed bergs were small in 1964 to 73 percent in 1965. Since the total counts were approximately equal, the forecast for bergs south of 48° N. for the 1966 season could be expected to be not more than half of that observed in 1965. The proviso that comparable oceanographic and meteorological conditions would prevail had to be made. It was additionally forecast (refer to "Report of the International Ice Patrol Services in the North Atlantic of 1965") that, under favorable iceberg environmental conditions, as few as 20 icebergs could be expected to survive the journey south to the Grand Banks. On the 4th of January 1966, strong cyclonic activity passed over Newfoundland, drifting the icebergs westward against the coastline and accelerating deterioration. The intense low pressure system of the 29th of January did immense property damage and wreaked havoc with Newfoundland coastal towns. The same system completely destroyed all the icebergs south of latitude 54°50′ N. On the 15th of February another intense low passed over southern Labrador. So destructive were these storms to bergs and pack ice that a revised forecast, based on

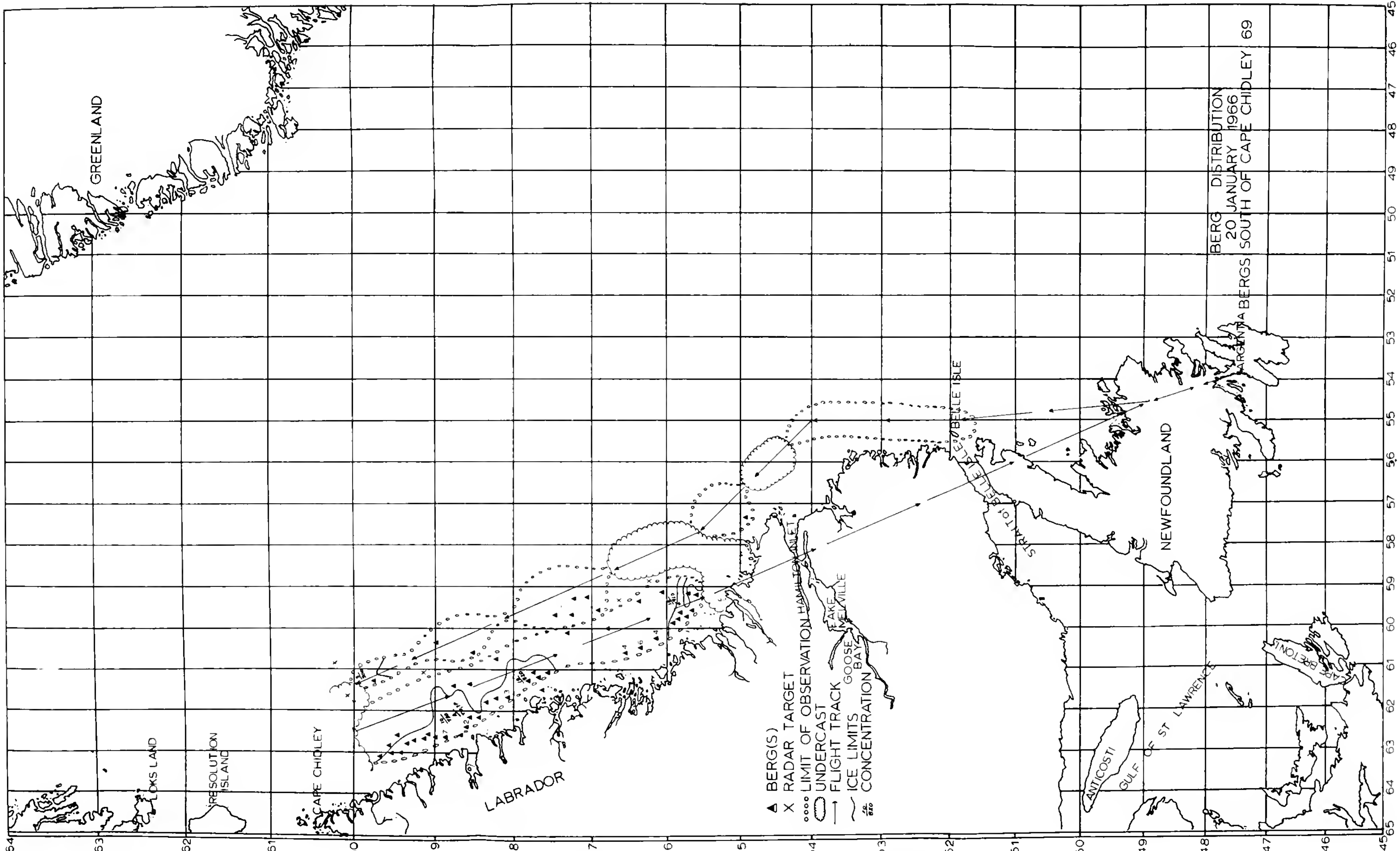

FIGURE 2.—Ice conditions—Newfoundland to Labrador on 20 January 1966.

the latest observed distribution and size of icebergs to Hudson Straits had to be made. It was estimated that not one iceberg would drift south of latitude 40° N. Continued cyclonic activity passing over and south of Newfoundland in February and March materially assisted in supporting this conclusion.

By late February, a tongue of field ice had penetrated south to 47°50′ N. along the Avalon Peninsula. The maximum southern extension of field ice was 47°30′ N. on 17 March 1966. However, this was a narrow tongue of open pack. The close pack was mainly north of 49° N. By 24 March, only a narrow strip of open pack along the Newfoundland coast was to be found south of 50° N., and by 8 April, only occasional open pack was located along the Newfoundland coast. A narrow band of close pack extended north of 51° N. By 20 April, only occasional narrow bands were observed along the Labrador coast up to Hamilton Inlet.

Throughout the ice season, the predominant winds were onshore, tending to drift the few bergs distributed along the Labrador coast into the heavily indented shoreline. The southernmost berg was located on the 28th of February at 49°05′ N., just off the Newfoundland coast.

Table 1. Estimated number of icebergs south of 48° N, 1900–66

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual
1900–45	118	447	2,101	4,811	7,156	3,486	1,199	397	247	107	106	80	20,253
1946	0	2	67	48	168	88	7	0	0	0	0	0	430
1947	3	1	2	5	11	26	15	0	0	0	0	0	63
1948	0	0	60	210	185	68	0	0	0	0	0	0	523
1949	0	0	1	23	20	3	0	0	0	0	0	0	47
1950	0	12	1	183	135	58	7	0	1	1	2	0	460
1951	0	3	2	0	0	0	0	0	0	0	0	1	6
1952	0	0	0	12	2	0	0	0	0	0	0	0	14
1953	0	0	21	11	18	6	0	0	0	0	0	0	52
1954	1	16	47	165	65	16	2	0	0	0	0	0	312
1955	0	0	10	32	14	5	0	0	0	0	0	0	61
1956	0	0	9	13	34	21	3	0	0	0	0	0	80
1957	3	43	41	172	265	288	113	6	0	0	0	0	931
1958	0	0	0	0	0	0	1	0	0	0	0	0	1
1959	0	0	14	266	180	186	43	0	0	0	2	3	693
1960	3	0	41	161	44	4	0	0	0	0	0	0	253
1961	0	0	60	30	16	1	0	0	0	1	0	1	117
1962	0	0	14	72	21	10	3	0	0	0	0	0	120
1963	0	0	4	20	0	0	1	1	0	0	0	0	26
1964	0	1	88	225	19	28	5	1	0	0	0	0	369
1965	0	0	19	33	22	1	0	0	0	0	0	0	76
1966	0	0	0	0	0	0	0	0	0	0	0	0	0
Total, 1946–66	10	87	561	1,731	1,219	809	200	8	1	2	4	5	4,634
Total, 1900–66	128	534	2,662	6,542	8,375	4,295	1,399	405	248	109	110	85	24,887
Average, 1946–66	0.5	4.1	26.7	82.4	58.0	38.5	9.5	0.4	0.0	0.1	0.2	0.2	221
Average, 1900–66	1.9	8.0	39.7	97.6	125.0	64.1	20.9	6.0	3.7	1.6	1.6	1.3	371

NOTES

1. The totals for 1946–66 are based mainly upon aircraft reconnaissance and are more accurate than prior estimates.
2. The totals for 1900–45 are based mainly on ship reports of other than Ice Patrol vessels.

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An unseasonal shift of tracks was recommended on 18 April 1966 and Trans-Atlantic Lane Routes C and D were maintained in effect. On 28 April 1966, the rather exceptional 1966 International Ice Patrol Season was terminated. Detailed monthly ice conditions appear in a latter section.

AERIAL ICE RECONNAISSANCE

Thirteen ice observation flights were made, using two Lockheed Hercules (HC–130B) aircraft, by the U.S. Coast Guard Air Station, Argentia, Newfoundland, during the ice season. These flights averaged 1,100 miles in length and 5.1 hours long. The longest flight was 2,609 miles in length. In addition, seven preseason and four postseason ice observation flights were conducted.

The primary objective of the aerial ice reconnaissance was to guard the southeastern, southern, and southwestern limits of the ice-encumbered area in the vicinity of the Grand Banks so that shipping might be advised of the extent of the dangerous area. In addition, the aerial ice reconnaissance had the purpose of maintaining detailed up-to-date information on the ice situation in the Grand Banks region and north for the benefit of mariners traversing the ice area. Ice reports from shipping were of invaluable assistance in attaining these objectives.

The flight plans were usually made up of a system of parallel lines spaced at about 20 to 25 mile intervals, depending on visibility. The spacing was predicated on the ability of readily sighting bergs at 15 miles, hence, it provided a margin of overlap on parallel tracks and covered a sufficiently large search area. From past experience, it appeared that this search pattern is quite efficient for the purposes of detecting ice on days with good visibility. When poor visibility occurred, such that 15-mile visual sightings of bergs was precluded, this spacing appeared to be the optimum for a radar search and permitted sufficient reserve of flight hours to divert the aircraft from the pattern in order to identify targets. A trained aerial ice observer was assigned to each ice reconnaissance flight. Loran-A was the primary positive method of air navigation. An airborne doppler sensor system was used to navigate all flight plans, corrected when possible, by Loran-A or other available means. The use of doppler radar visual readout presentations provided the ice observer continuous track and cross track information greatly assisting, and increasing the accuracy, in positioning bergs. Maneuvers off the prescribed tracks, once extremely difficult to plot, could now be plotted. Radar aided the observer in locating ice, especially when visibility conditions were minimal. A passive microwave radiometer, with the frequency selected for optimum ice emissivity, was installed on one Ice Patrol aircraft. A full evaluation could not be conducted due to continuing aerodynamic problems caused by the location of the microwave antenna dome.

As in past years, the prevalance of fog in the Grand Banks area hampered the effectiveness and systematic scheduling of ice reconnaissance flights. Weather reports from shipping and weather forecasts made by the U.S. Navy Fleet Weather Central at Argentia were extremely helpful in avoiding scheduling of flights during periods of low visibility in the search areas. When periods of low visibility continued for a number of days and it appeared, due to previous observed ice conditions, that a dangerous situation might develop in the steamer tracks, ice reconnaissance flights were flown depending solely on radar to detect targets.

Flight statistics for the season are presented in table 2, Aerial Ice Reconnaissance Statistics—1966 Season.

Table 2. Aerial ice reconnaissance statistics—1966 season

Month	Number of flights	Number days flights made	Average visual effectiveness (percent) [1]	Maximum number days between flights	Hours flown
March	8	8	92	7	39.2
April	5	5	76	7	26.7
Total	13	13	84	7	65.9

[1] Ratio (×100) of area actually searched visually to area planned to be searched.

COMMUNICATIONS

The ice reports collected from ships, aircraft, and ice observation agencies were plotted, analyzed, and during periods when aerial ice reconnaissance flights were not made, ice conditions were forecast for the forthcoming 12-hour period. This analyzed and forecast information was used to prepare the ice advisory broadcasts and bulletins, the primary means of disseminating ice information to shipping.

From 1 March 1966 to 28 April 1966, ice information was broadcast twice daily to shipping by U.S. Coast Guard radio station (NIK) at 0048 G.m.t. and 1248 G.m.t. simultaneously on 155, 5320, 8502, and 12,880.5 kcs. Each broadcast was preceded by a general call on 500 kcs. with instructions to shift to the above operating frequencies. A 2-minute period of test signals transmitted on the operating frequencies facilitated receiver tuning. Each broadcast was transmitted twice, once at 15 words per minute and once at 25 words per minute. Prescribed radio silent periods were observed. Ice bulletins were also sent via teletype to the U.S. Navy Oceanographic Office, Washington, D.C., for further dissemination by twice daily broadcasts by U.S. Navy Radio Washington (NSS) on the regular "Hydro" broadcasts, for inclusion of a daily ice chartlet in the daily memorandums, and for a weekly ice chartlet. Ice bulletins were also sent via teletype to the Canadian

Department of Transport, R.C.N. Radio Station, Albro Lake, Nova Scotia, and others for general dissemination.

Ice conditions were also broadcast by facsimile at 1330 G.m.t. daily on 5320, 8502, and 12,880.5 kcs.

Frequently, regular ice broadcasts concluded with the request that all shipping in the Ice Patrol area report to NIK all ice sighted, weather conditions, and sea temperatures every 4 hours. The effectiveness and efficiency of the International Ice Patrol was considerably enhanced by the excellent response by shipping to this request.

Duplex radio operations were used between NIK and merchant ships for general radio communications. Merchant ships worked NIK on 500 kcs. and 8 and 12 mcs. maritime calling bands. NIK worked 427, 8734, or 12,718.5 kcs. as appropriate.

During the 1966 season, ice patrol communications involved the handling of 3,791 radio messages and 2,816 landline messages of which 118 were ice broadcasts and 118 were teletype ice bulletins. Statistics concerning the reports received from shipping during the ice season are as follows:

Number of ice reports received from vessels	51
Number of vessels furnishing ice reports	32
Number of sea surface temperatures	1,592
Number of vessels reporting sea surface temperatures	174
Number of vessels requesting special information	19

The low number of reporting ships or requests for ice information was due to the continued absence of bergs or pack ice in the shipping lanes. Shipping was aware of these conditions through the medium of the Ice Broadcasts.

Throughout the remainder of the year, requests were received from shipping for ice conditions in the steamer tracks. The ice information contained in the answers was based on monthly aerial ice reconnaissance flights performed by the U.S. Coast Guard Air Station at Argentia through June 1966 and from sparse information received from other sources. Due to the very small distribution of bergs south of Hudson Straits, assumptions that the bergs would not penetrate the steamer tracks could be made with excellent assurance.

A total of 132 ice requests were received and answered from ships representing the United States of America, United Kingdom, Netherlands, Federal Republic of Germany, France, Norway, Sweden, Belgium, Liberia, Union of Soviet Socialist Republics, Italy, Canada, Denmark, Greece, Ireland, Israel, Poland, Spain, Finland, and Ghana until the radio broadcasts were initiated on 1 March. Six ice requests were received and answered after the termination of the ice season until 31 December 1966.

The percentage distribution of the reporting vessels by nationality during the Ice Patrol season was as follows:

United States of America	28.0	Italy	1.7
United Kingdom	26.4	Canada	1.0
Netherlands	12.8	Denmark	1.0
Federal Republic of Germany	7.1	Greece	1.0
France	4.1	Ireland	.7
Norway	3.7	Poland	.7
Sweden	3.0	Spain	.7
Belgium	2.4	Finland	.3
Liberia	2.4	Ghana	.3
Union of Soviet Socialist Republics	2.0		99.3

MONTHLY ICE CONDITIONS—1966

JANUARY

The Grand Banks area remained clear of ice throughout January (refer to a prior section of this bulletin for an explanation). A flight to Cape Chidley, Labrador, on the 20th observed a minimum number of bergs and only a narrow band of pack ice extending northward along the Labrador coast. Figure 2 shows the distribution of bergs and delineates the pack ice south of Cape Chidley. On the 29th, an intense low accompanied by hurricane force winds (refer to fig. 3), passed south of Newfoundland. This storm, with wind-driven waves in excess of 22 feet destroyed all bergs south of 54°50′ N. latitude and destroyed a great deal of the pack ice as far north as 58° N. latitude.

The Strait of Belle Isle remained open for shipping throughout the month. Sea ice began to form in the western part of the Gulf of St. Lawrence. The eastern Gulf of St. Lawrence and Cabot Straits remained free of ice except for a narrow strip of open pack along the Labrador coast.

FEBRUARY

The Grand Banks remained free of ice throughout February. By the 10th, pack ice, with only a few growlers, extended south to only 49°20′ N., 51°50′ W. By the 24th, pack ice, with only a few growlers, extended south to 47°50′ N, 52°00′ W. The intense low of the 15th, located at 53° N., 53° W. at 0600 G.m.t. of that date, generated large waves, materially aiding pack ice and berg deterioration as far north as Cape Chidley, Labrador. The southernmost berg was located at 49°25′ N., 52°50′ W. on the 25th. Only 18 bergs were observed from Notre Dame Bay to Belle Isle area.

The predominant winds for the month were onshore and relatively warm. The bergs and pack ice were contained close inshore along Newfoundland and Labrador. Refer to figures 4, 5, and 6 for the distribution of ice to Cape Chidley, Labrador, and the abnormal weather conditions, respectively.

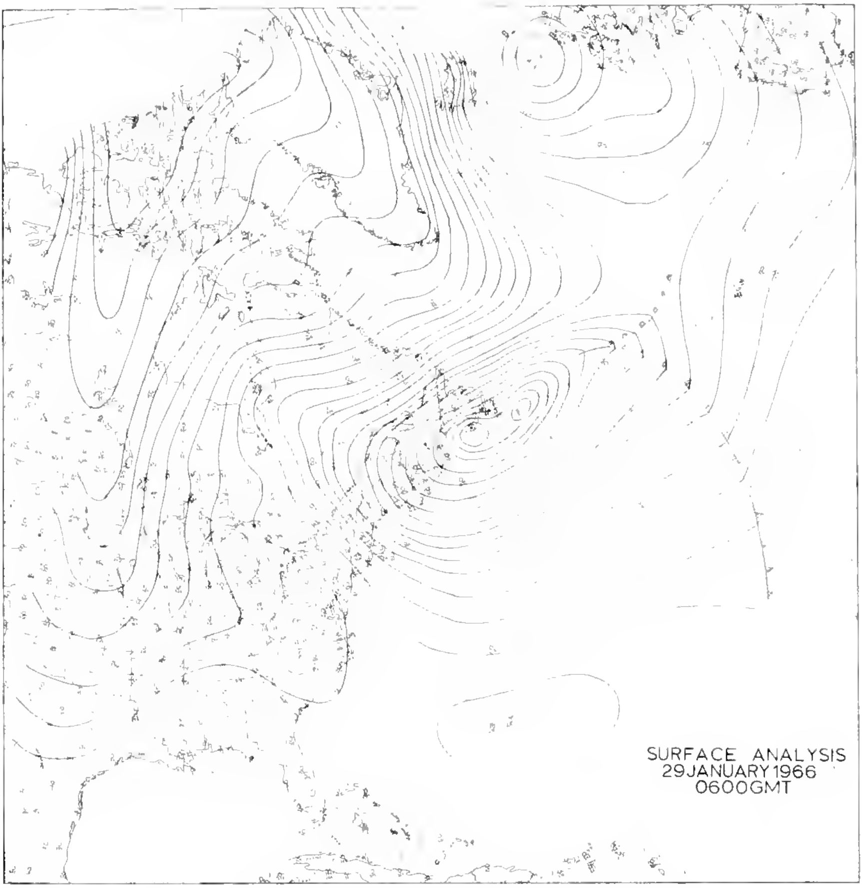

FIGURE 3.—Surface pressure chart, 29 January 1966.

MARCH

Continued warming throughout the month, with well above normal air temperatures on the 7th and 25th generally throughout the Newfoundland-Labrador coastal oceanic regions, abetted faster than normal pack ice deterioration and increased sea surface temperatures. The southernmost penetration of ice for the month occurred on the 11th when pack ice and many growlers drifted to 47°30′ N., 52°30′ W. Several growlers drifted to 46°55′ N., 52°15′ W. where they quickly deteriorated. The easternmost penetration of the pack ice occurred on the 18th with drift to 48°20′ N., 50°40′ W.

Only a few bergs were in evidence around Fogo Island. No more than eight small to very small bergs were ever observed south of Belle Isle. By the end of the month, only very open pack existed south of 51° N. and the only berg noted was the one that had been observed several weeks prior and was still aground near Fogo Island. Refer to

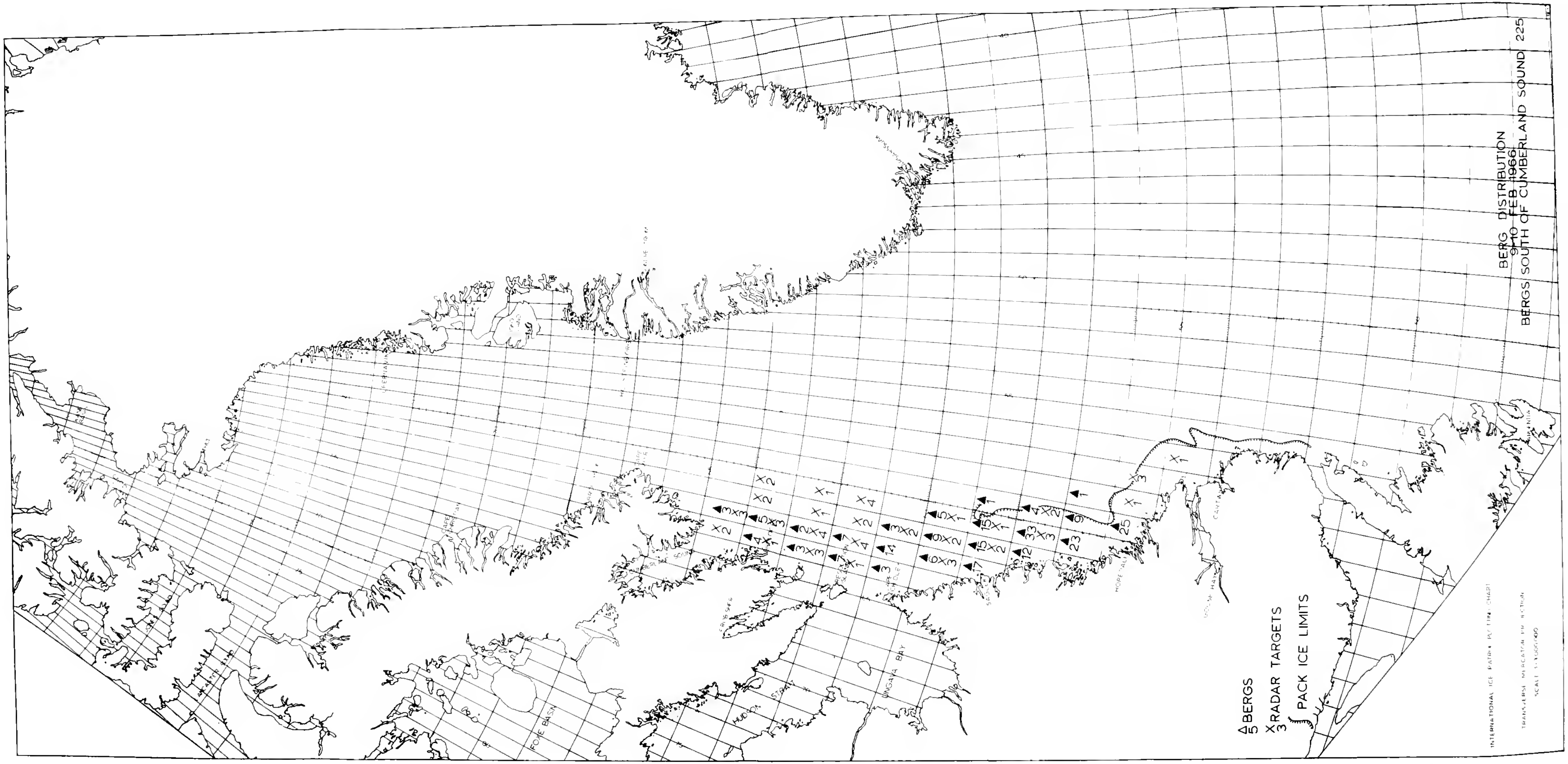

FIGURE 4.—Ice conditions—Newfoundland to Labrador on 9–10 February 1966.

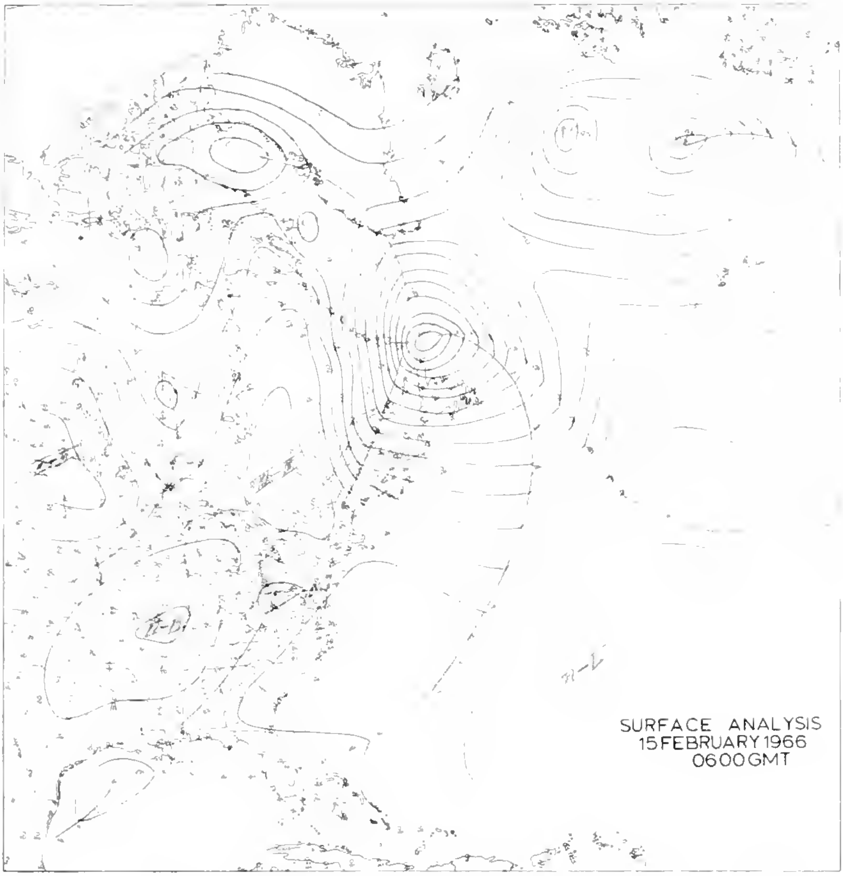

FIGURE 5.—Surface pressure chart, 15 February 1966.

figure 7 and 8 for the distribution of ice to Cape Chidley, Labrador. Figure 8 was compiled from ESSA I data transmitted to the Ice Patrol by the U.S.C.G. Oceanographic Unit, Washington, D.C.

The winds were predominantly onshore over northern Newfoundland and Labrador, containing the pack ice and a few bergs along the coast. On the 3d, 11th, and 31st, three low pressure systems with winds in excess of 40 knots greatly aided containment and deterioration of pack ice and bergs along the Labrador coast.

The 1966 season had been defined in December 1965–January 1966 on the basis of the surface pressure patterns and observed distribution of bergs to Cape Christian, Baffin Island. The continued predominance of southerly and onshore winds insured the continued absence of ice. During the last week of March it was decided to end the Patrol as soon as it became completely evident that southward berg drift into the shipping lanes was improbable. The pattern was established and

confirmation that the Labrador Current on the eastern slope of the Bank was missing or weak awaited the outcome of the U.S.C.G. Cutter *Evergreen's* first oceanographic survey in April.

APRIL

Continued warming throughout the month with well above normal air temperatures on the 23d, generally throughout the Newfoundland-Labrador coastal oceanic areas, further deteriorated the pack ice and increased sea surface temperatures. The southernmost penetration of ice occurred on the 8th when ice was observed at 49°00′ N., 52°40′ W. Two bergs still remained grounded at Fogo Island. No other bergs were observed south of Belle Isle. Only a few persistent stragglers remained in the Straits of Belle Isle. Winds were predominantly onshore for the month (refer to fig. 9 for the distribution of ice to Cape Chidley, Labrador).

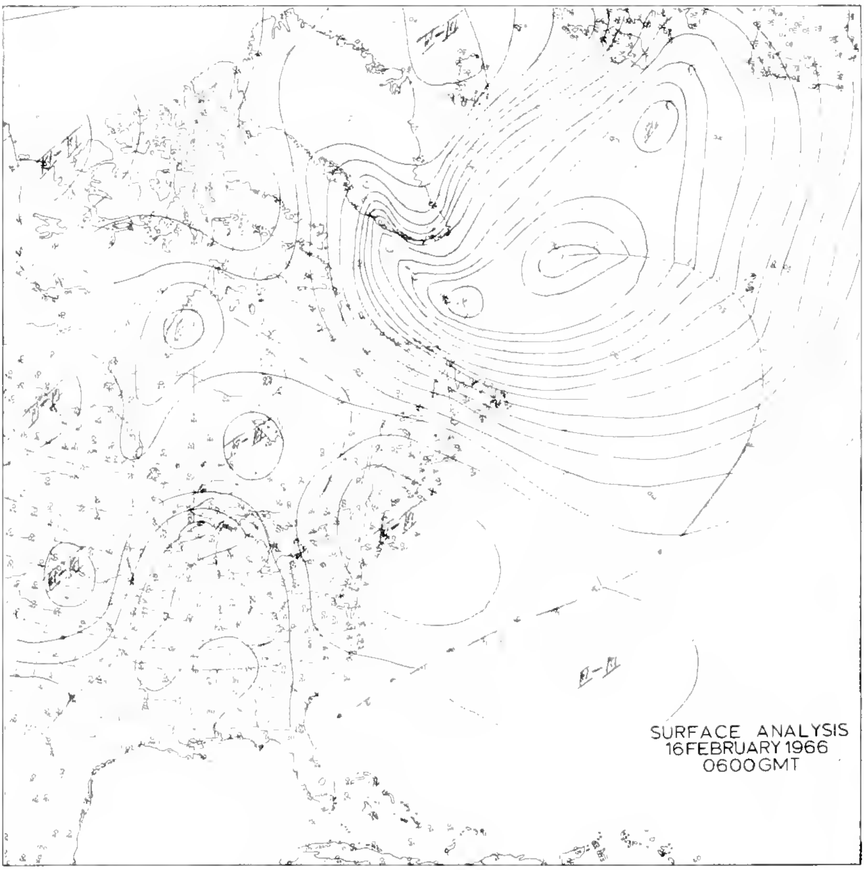

FIGURE 6.—Surface pressure chart, 16 February 1966.

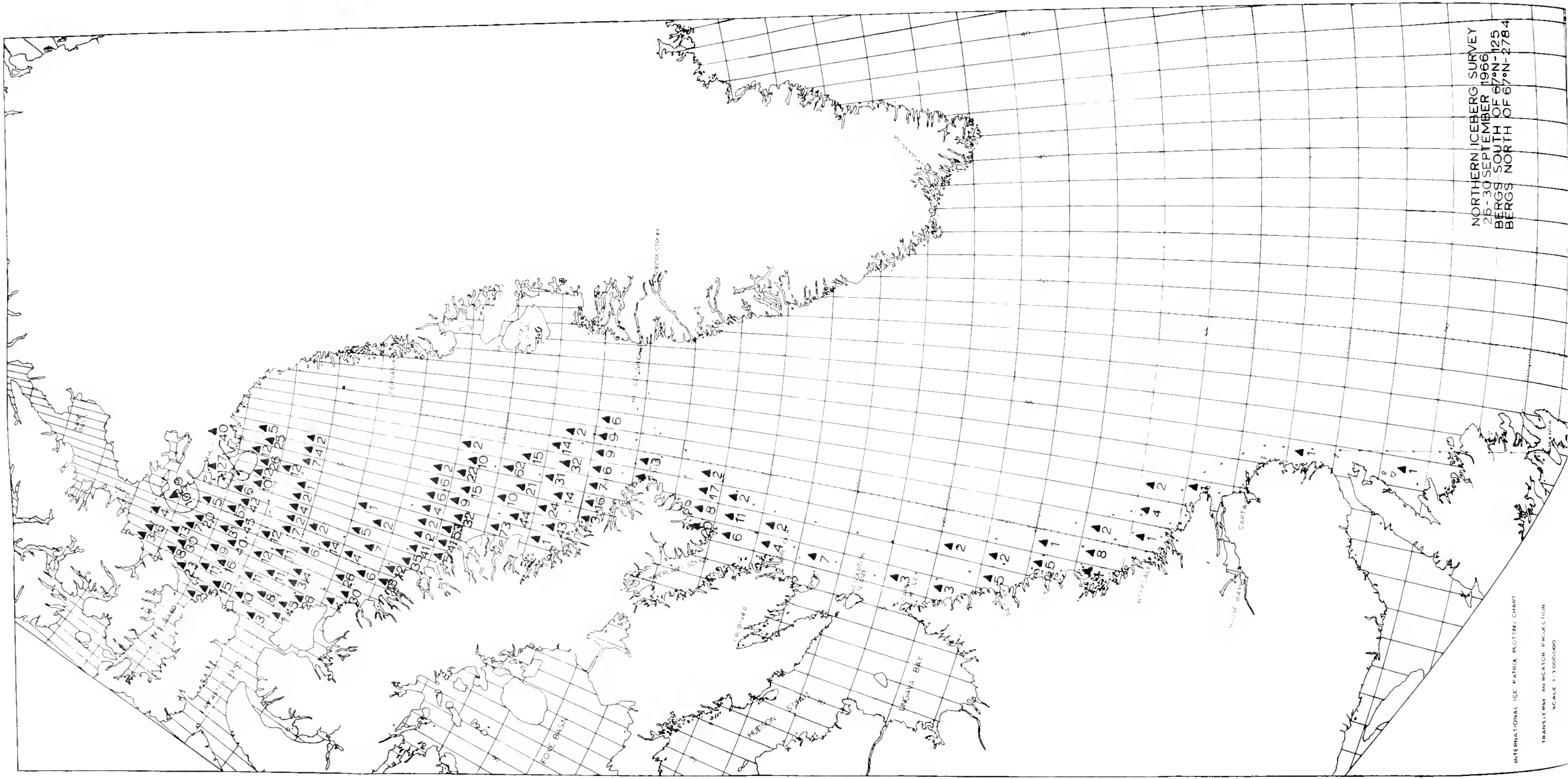

FIGURE 12.—Iceberg survey, Newfoundland to Baffin Bay, 26–30 September 1966.

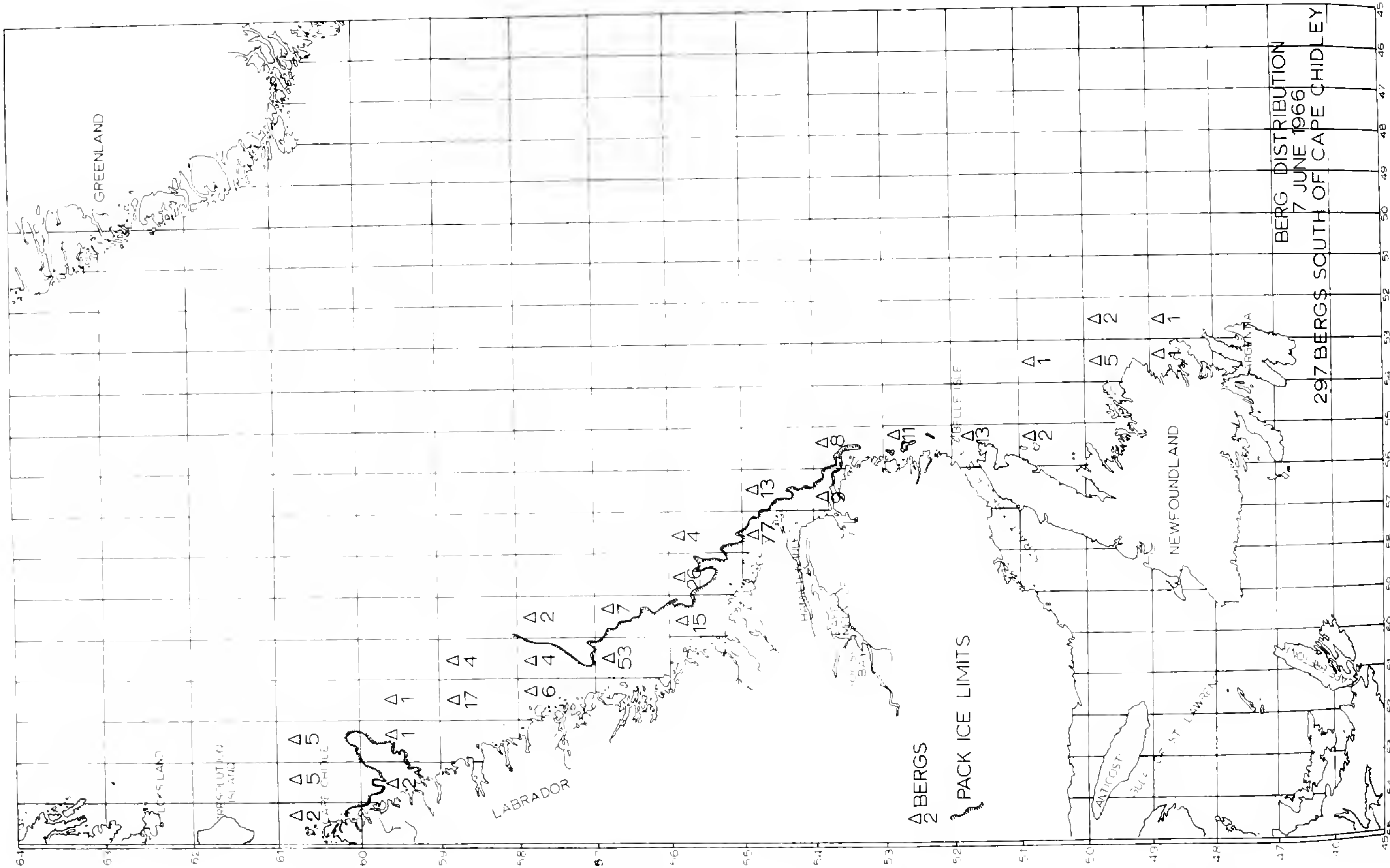

FIGURE 11.—Ice conditions—Newfound to Labrador on 7 June 1966.

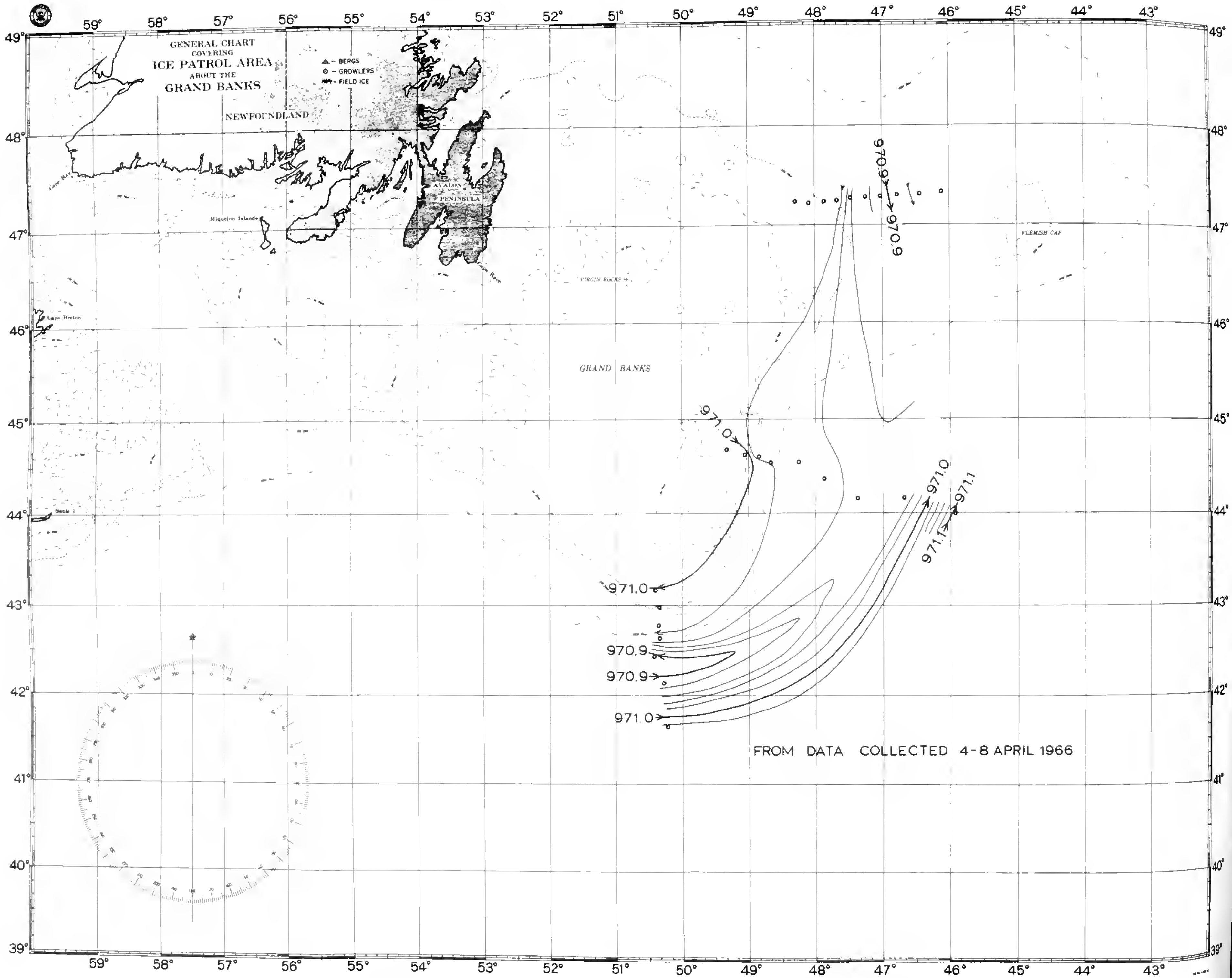

FIGURE 10.—Dynamic topography of the sea surface relative to the 1,000 decibar surface—From the data collected 4–8 April 1966.

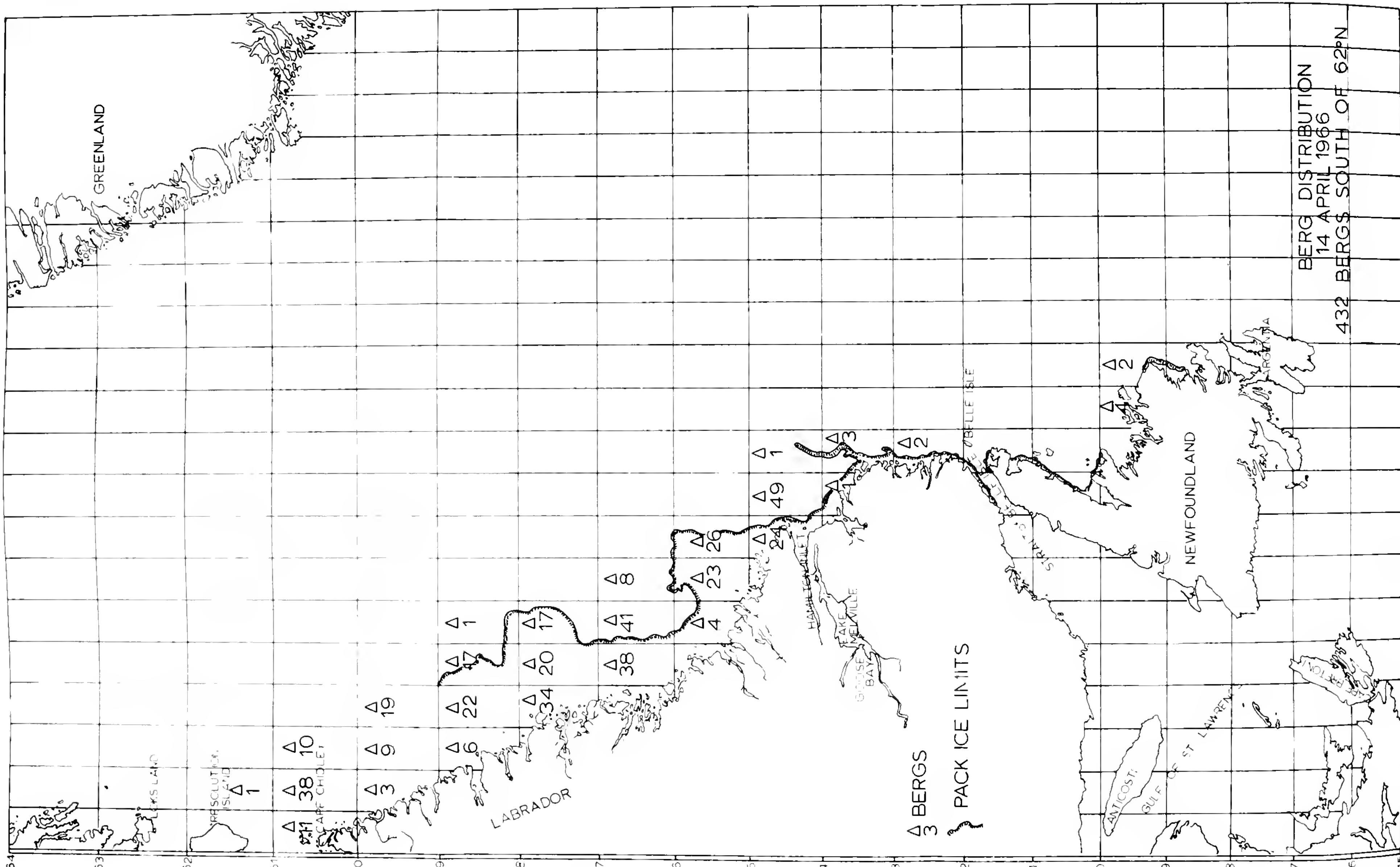

FIGURE 9.—Ice conditions—Newfoundland to Labrador on 14 April 1966.

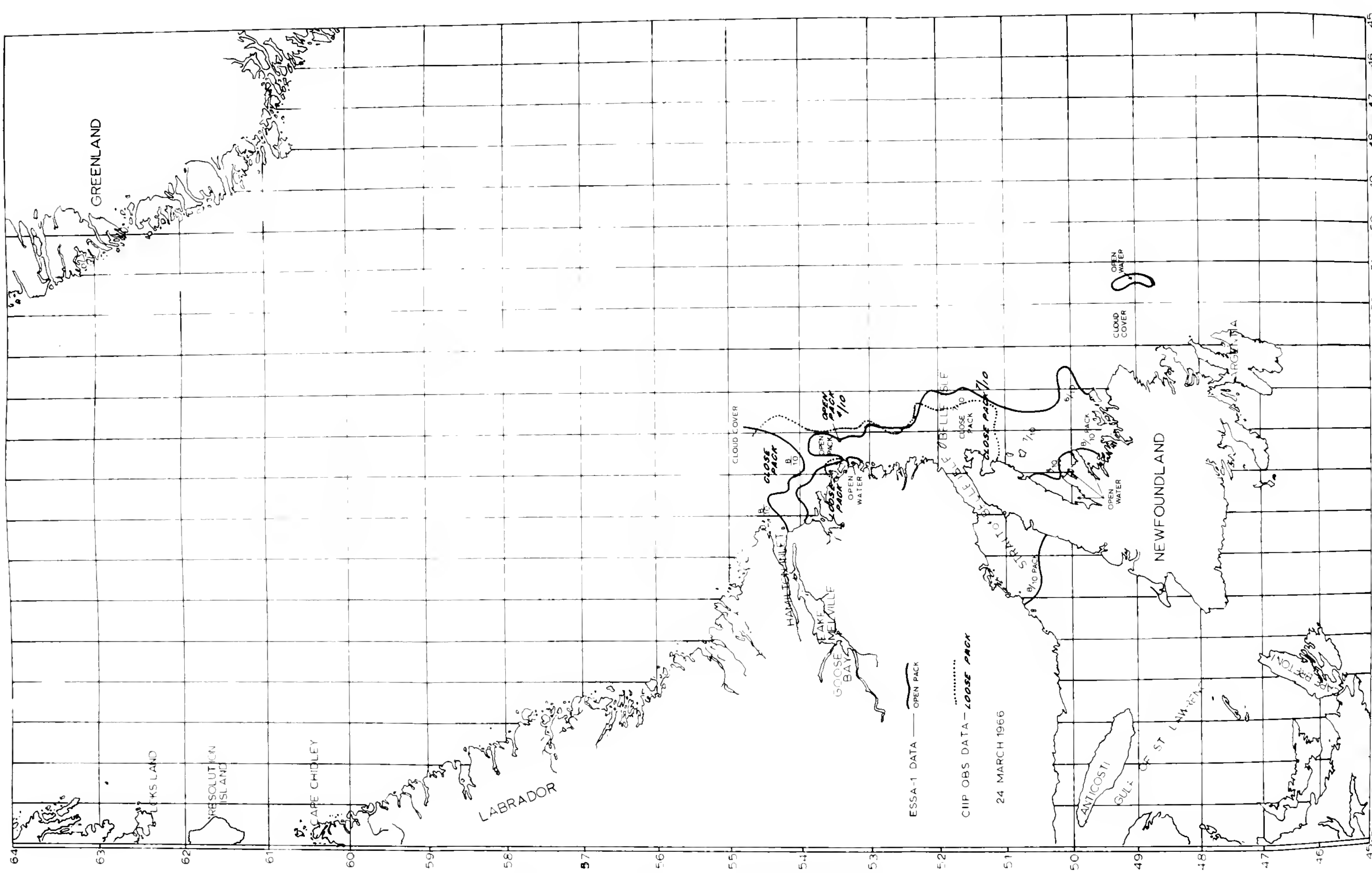

Figure 8.—Ice analysis of ESSA I photograph for 24 March 1966.

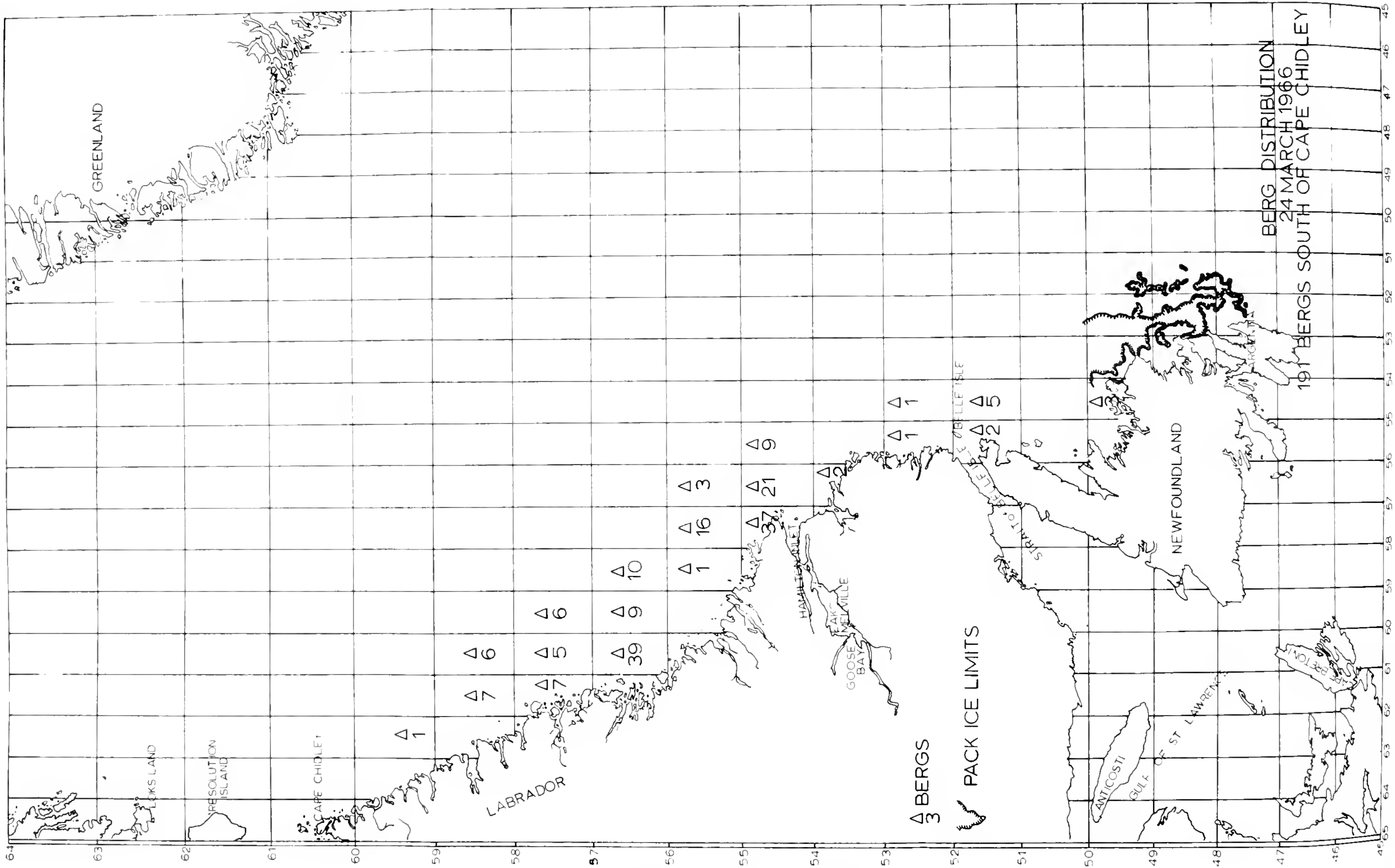

FIGURE 7.—Ice conditions—Newfoundland to Labrador on 24 March 1966.

The U.S.C.G. Cutter *Evergreen* completed the first oceanographic check survey on the 8th of April and an utter absence of any defined Labrador Current was noted (refer to fig. 10 for the Dynamic Topography of the Grand Banks).

Therefore, after advising shipping for a suitable period of time, the 1966 Ice Patrol was ended on the 28th.

MAY–DECEMBER

During May, bergs drifted south along the Labrador coast and Newfoundland under favorable winds. The southernmost berg was observed on the 28th of May at 49°11′ N., 52°46′ W. Of the 15 bergs observed on the 28th of May, one drifted to 48°48′ N., 50°46′ W., by the 20th of June. A small berg was reported on the 20th of June at 47°40′ N., 48°45′ W. but was never observed by the Ice Patrol aircraft and was probably a growler. No further reports or observations were made after the 20th of June.

The U.S.C.G. Air Station, Argentia, was disestablished 20 July 1966 and the International Ice Patrol was transferred to Commander, Eastern Area, U.S. Coast Guard, New York, who assumed the responsibilities of Commander, International Ice Patrol.

No ice reports were received throughout the rest of the year. The September and December Northern Berg Survey flights did not observe any bergs or pack ice south of Labrador (refer to figs. 11 and 12 for the distribution of ice to Cape Chidley, Labrador, and Northern Iceberg Survey).

ON THE DISTRIBUTION OF ICEBERGS

Aerial ice reconnaissance flights to determine the distribution of icebergs by number and size were continued. These flights can be divided into two groups: Flights from Newfoundland to Cape Chidley, Labrador, to assess iceberg potential for the current season and flights to western Baffin Bay to determine iceberg potential for the forthcoming season. This data was then analyzed relative to the potential drift and deterioration rate by inspection of surface pressure charts, assessment of available oceanographic data, comparison with mean frost-degree days, and air temperatures at selected stations. The programs for quantitative and qualitative interpretation of berg drift and deterioration in open, nonice-covered waters, as well as detailed oceanographic investigations into the circulation of the Labrador Sea-Baffin Bay were continued by the U.S.C.G. Oceanographic Unit (refer to U.S.C.G. Oceanographic Reports, Series CG–373).

The aerial iceberg surveys conducted north of the Grand Banks and including all of the western Baffin Bay-Labrador Sea were continued (refer to figs. 2, 3, 7, 9, 11, and 12 for the data from aerial surveys

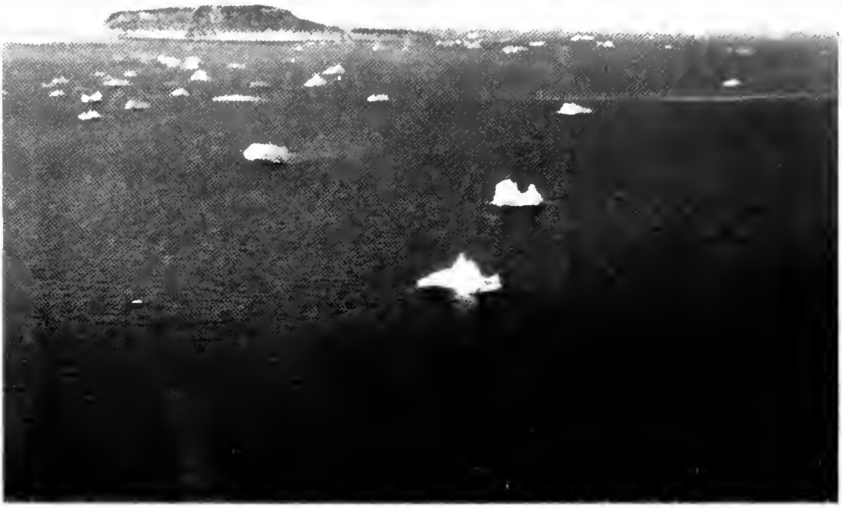

FIGURE 13.—Small sized icebergs observed 26–30 September 1966.

FIGURE 14.—Medium sized icebergs observed 26–30 September 1966.

FIGURE 15.—Medium sized pinnacled drydock type iceberg observed 26–30 September 1966.

conducted from Newfoundland to Cape Chidley, Labrador; refer to Bulletin No. 51 of this series for the aerial berg surveys of western Baffin Bay). A comparison of the latter flights for 1965 with prior years had shown fewer and smaller bergs throughout the western Baffin Bay-Labrador Sea. On the basis of this distribution and the average berg size, a forecast was made that if abnormally favorable conditions for southward berg drift and survival to the Grand Banks prevailed, as many as 100 bergs would drift south of latitude 48° N., if unfavorable conditions prevailed as few as 20 bergs would survive. Extremely unfavorable conditions prevailed and not one berg drifted south of latitude 48° N.

The following paragraphs are intended to explain the existing conditions and the reasons for the high berg deterioration en route to the Grand Banks.

THE EFFECT OF SEA LEVEL ATMOSPHERIC PRESSURE DISTRIBUTION ON THE GRAND BANKS ICE SEASON

The study of the effect of surface winds on the drift of bergs from Baffin Bay to the Grand Banks provides an indication of the pressure tendency, or increase or decrease, of the southerly rate of flow of bergs. The northern aerial berg surveys provide the data on the distribution

of bergs on which to apply the pressure tendency. As the area encompassed by the bergs is vast, and as the pressure distribution may vary considerably from the northern to the southern areas, the bergs that pose a potential threat to the Grand Banks from March to July are divided into two groups for ease of analysis. The first group includes those bergs located between Hudson Strait entrance to Cape Dyer in early November. The second group includes those bergs betweeen Cape Dyer and Bylot Island, also in November. The successive monthly locations of the two groups of the berg crop can be assumed or estimated, using available northern berg survey observations and taking into account drift due to the current systems.

Table 3 is a statistical summary of the effect of mean surface winds correlated with the number of bergs drifting south of latitude 48° N.

The daily surface pressure charts were analyzed and were compared to the U.S. Weather Bureau monthly sea level atmospheric charts. The differences noted were due to the averaging techniques masking short periods of great deviation observed in the daily charts. This deviation can play an important part in assessing berg-crop drift as, in general, from Cape Dyer south to Newfoundland, bergs can be driven aground, entrapped in the many bays and indentations along the coast, and not be permitted to drift free under favorable wind conditions.

The daily weather surface pressure charts, developed by the U.S. Fleet Weather Facility, Argentia, Newfoundland, were also analyzed to determine if surface wind conditions were such as to indicate a radical change in oceanic circulation of the Labrador Sea-Grand Banks area (refer to figs. 3, 5, and 6). A qualitative application of wind driven oceanic circulation theories, with emphasis on the effect of wind on surface current direction and mass volume transport, was applied. The area investigated was the North Atlantic Ocean or the subpolar gyre. The qualitative analysis compared very favorably with later oceanographic investigations conducted in the Labrador Sea-Grand Banks area.

In December 1965, during a routine inspection of the weather surface pressure charts of the North Atlantic, it was noted that the passage of all lows was well to the southward of the normal track. This trend was carefully monitored on a day-to-day basis. By the end of January 1966, this trend had continued in effect and it became obvious that the circulation of the North Atlantic Ocean would reflect this radical change in wind direction. Figures 16, 17, and 18 are the Mean Sea Level pressure charts for the months of December 1965, and January and February 1966. An analysis of these charts will provide a more pertinent evaluation on how wind stresses over the sea surface could affect a large change from the normal oceanographic regime.

Table 3. Average monthly surface wind conditions for iceberg drift towards the Grand Banks; 1957–66

[Based on U.S. Weather Bureau monthly mean sea level pressure distribution charts]

Month	1957		1958		1959		1960		1961		1962		1963		1964		1965		1966	
	1st [1]	2d [2]	1st	2d	1st	2d	1st	2d	1st	2d	1st	2d	1st	2d	1st	2d	1st	2d	1st	2d
October																			VU	SF
November	VF	VF	SF	N	VF	SF	F	SU	SF	N	SU	N	U	U	N	U	U	U	VU	VU
December	VF	VF	SF	SF	VF	F	VF	F	F	F	U	U	U	VU	F	N	U	U	VF	U
January	VF	VF	F	SF	SU	SU	SU	SF	F	F	VF	N	U	VU	VF	VF	VF	......	VU	VU
February	VF	F	U	U	VF	VF	U	N	VF	F	SF	F	F	SU	F	SF	N	U	SU	SU
March	N	U	U	U	VF	SF	SF	N	SU	SU	VU	VU	VF	U	VF	U	......	......	VU	VU
April	VF	VF	VU	N	F	F	F	SF	SU	U	SF	U	U	U	VF	F	SU	N	......	F
May	......	VF	......	VU	......	F	......	N	......	U	......	N	......	N	......	VF	......	SU	......	......
June	......	VF	......	VU	......	N	......	VU	......	U	......	U	......	U	......	N	......	SU	......	......
Estimated overall average during travel time	VF−	F+	SU	SU+	F	SF+	SF−	N	SV−	SU−	N	SU−	SU−	U−	F+	SF	SF−	SU+	U+	VU
	VF−		SU		F−		SF−		N		SU−		SU		F−		SU		VU	
Number of bergs south of 48° N	931		1		693		253		115		121		25		369		76		0	

Code: F Favorable
U Unfavorable
V Very
S Slightly
N Neutral

[1] First half berg crop.
[2] Second half berg crop.

NOTE: To estimate overall wind conditions for each year, give double weight to months December–April for first half of berg crop and double weight to months January–June for second half of berg crop.

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Prevailing winds for this period remained conducive to increasing the westward flow of warmer water towards Greenland, reinforcing the West Greenland Current, for the development of a shallow counter-clockwise gyre of relatively warm water south of Davis Strait, and of lateral mixing of this gyre with the colder waters of the Labrador Current.

The resultant effect would greatly hasten deterioration of ice along the Labrador coast and reduce the possibilities of berg survival towards the Grand Banks. The passage of these laws also would bring warmer air over Newfoundland-Labrador, inhibiting ice growth. It was noted (record of observations not shown) that pack ice advanced southward to approximately the position of Hopedale, Labrador, comparable to normal conditions. At this point, deterioration evidently became greater than advance and within the next few hundred miles the pack ice greatly thinned out and remained a relatively narrow ribbon of ice contained along the Labrador coast. Very light pack ice conditions prevailed for the ice season. The relative absence of pack ice meant that bergs had to travel southward in open water with attendant greater deterioration.

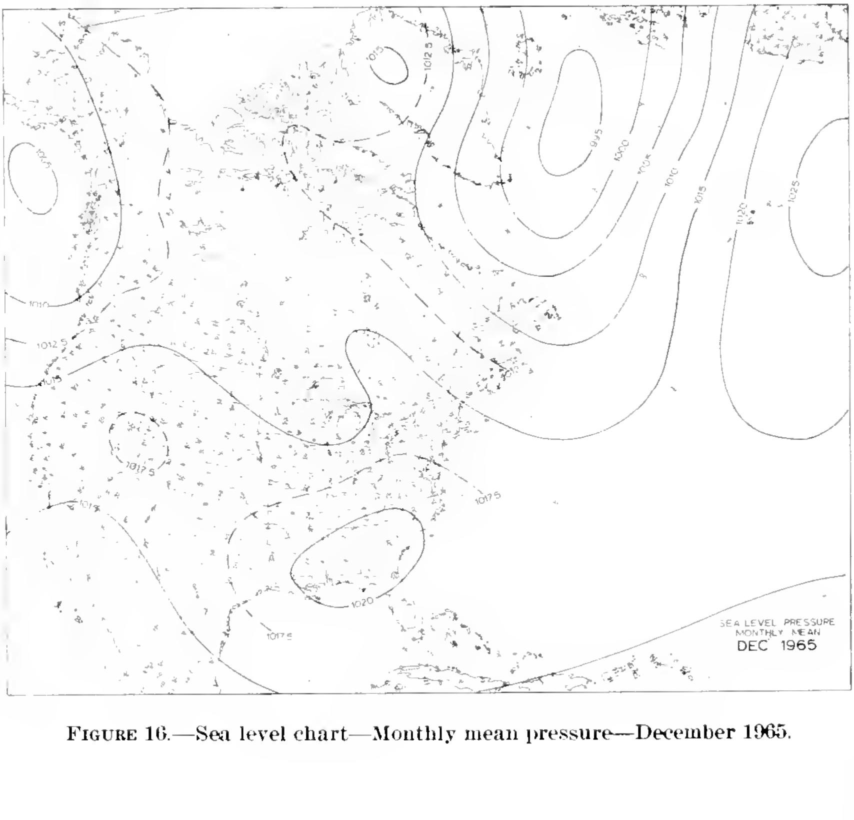

FIGURE 16.—Sea level chart—Monthly mean pressure—December 1965.

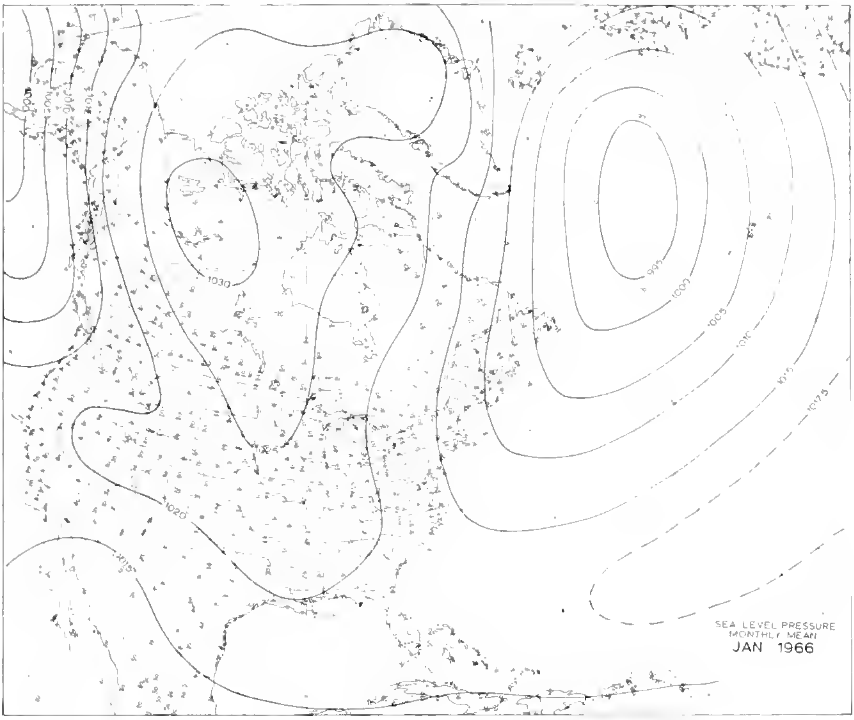

FIGURE 17.—Sea level chart—Monthly mean pressure—January 1966.

The warmer than normal air temperatures along the Labrador coast for January and February (refer to figs. 19 and 20) could perhaps be argued as in favor of inhibiting ice growth. However, there are other indications that the circulation of the Labrador Sea had shown a very definite warming trend. These were the higher than normal sea surface temperature reports received, an increase flow and increase in temperature of the West Greenland Current, and the general absence of a well defined Labrador Current.

Berg environment and sea surface temperatures throughout the Ice Patrol reporting area were noticeably higher throughout the season (refer to figs. 21 through 25). No well marked intrusion of cold water was noted on the slope of the Grand Banks. During 16–31 March 1966, the 32° F. isopleth did extend south of 45° N. but was placed well up on the Banks. This intrusion of cold water was distributed rather evenly over the Grand Banks and is coincident with the period of maximum pack ice penetration which had by 18 March extended south to a line from 47°40′ N., 52°40′ W., to 48°20′ N., 50°40′ W.

Throughout the period 1 March–30 April, much warmer than normal sea surface temperatures were observed north of 48° N. between approximately 45° W. to 48° W. longitude. With an apparent lack of

a well defined Labrador Current, the mixed water extended further eastward than ever noted. Prior years' Ice Patrol isotherm charts were used for this analyzation.

Another excellent indicator of a definite warming trend can be found by following the West Greenland Current. This current tends to keep an ice-free lead along the west Greenland coast to about Sondrestrom Fjord during the period of maximum advance. This year, open water extended well to the north of Upernavik by late May 1966.

A singular absence of a well defined Labrador Current was noted from the oceanographic data collected by the U.S.C.G. Cutter *Evergreen*. Figures 10 and 21 are the Dynamic Topography and Mean Sea Temperatures to 150 meters charts respectively compiled from data collected 4 to 7 April 1966. The mean sea temperatures do not indicate the presence of cold Labrador water. Zero degree average temperatures should normally be present. The dynamic topography chart shows flat contours and the absence of a normally well defined Labrador Current.

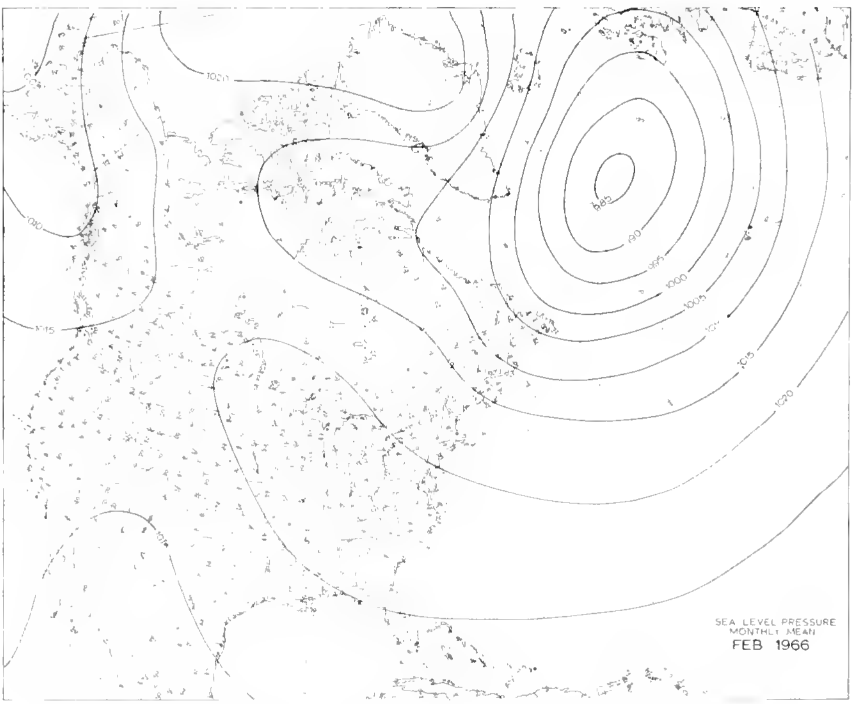

FIGURE 18.—Sea level chart—Monthly mean pressure—February 1966.

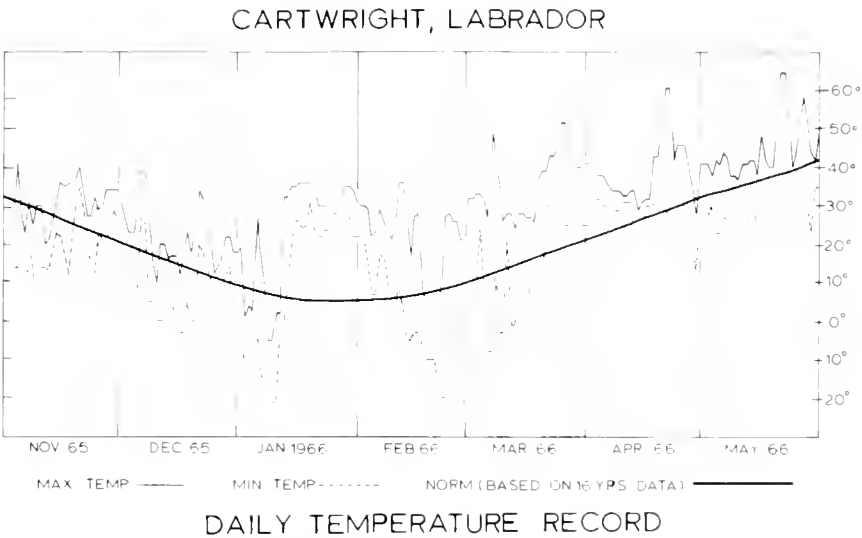

FIGURE 19.—Daily temperature record, Cartwright, Labrador.

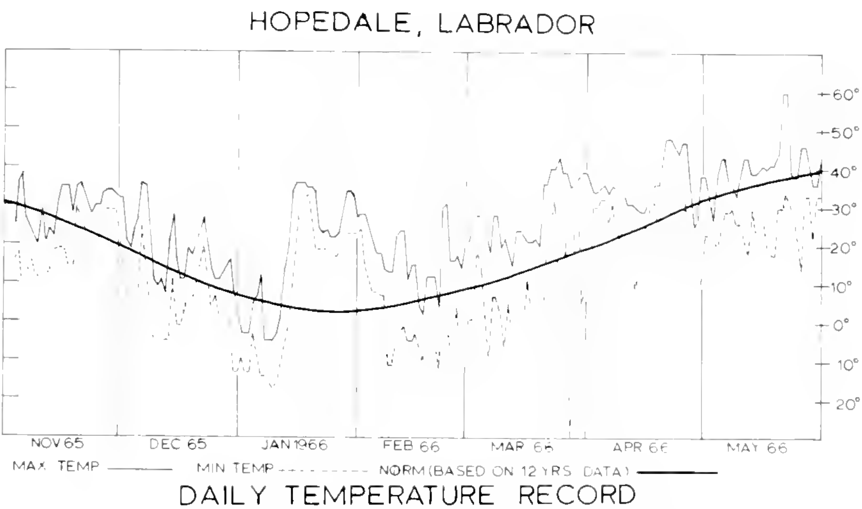

FIGURE 20.—Daily temperature record, Hopedale, Labrador.

THE CORRELATION BETWEEN FROST DEGREE DAYS OF SELECTED BAFFIN ISLAND-LABRADOR-NEWFOUNDLAND COASTAL STATIONS AND THE RELATIVE ICEBERG SEVERITY ON THE GRAND BANKS

Table 4 lists frost degree days accumulated for the winters 1956–66.

A comparison of the 1966 accumulated frost degree days with the 1956–66 average from Hopedale south is evidently the best means of correlating the berg forecast to the climatology of the area. This

Table 4. Frost degree day accumulations for selected Baffin Island, Labrador, and Newfoundland stations—winter months of 1956 through 1966

Station	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966	Average, 1956–66
Clyde River	4,920	6,787	6,289	6,454	6,154	6,348	6,760	5,364	6,030	5,721	6,128	6,124
Resolution Island	2,324	4,197	3,032	3,321	3,019	3,480	——	3,899	4,489	4,141	4,024	3,498
Hopedale	1,891	3,429	1,821	3,007	2,207	3,005	2,531	2,938	2,912	2,849	[1] 2,023	2,640
Cartwright	1,488	3,034	1,458	2,764	1,611	2,614	2,067	2,225	2,504	2,249	1,891	2,245
St. Anthony	791	2,136	864	1,964	1,021	1,899	1,283	1,453	1,650	1,318	1,168	1,420
Number of bergs south of 48° N	80	931	1	693	253	115	121	25	369	76	0	242

[1] Up to 28 February.

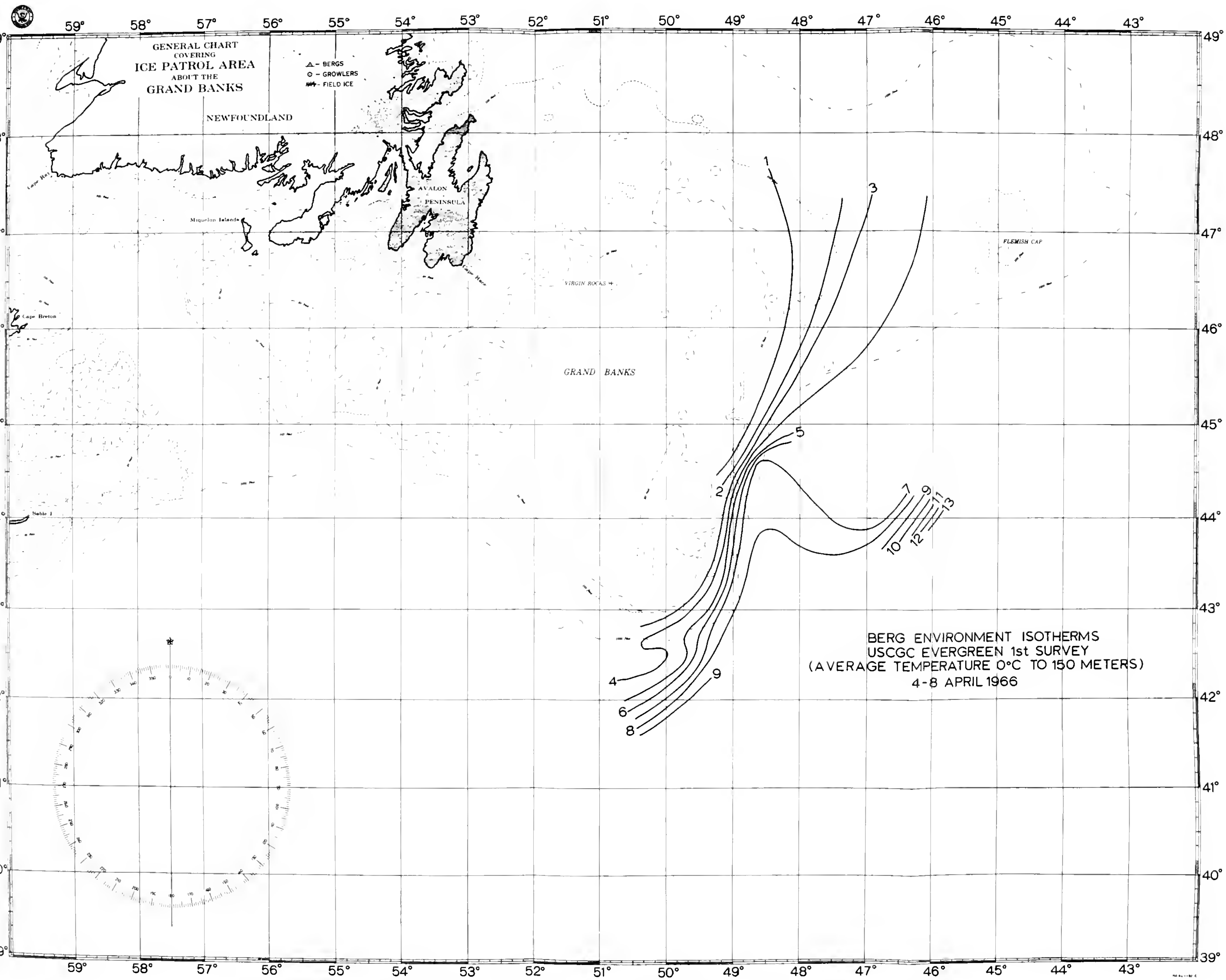

FIGURE 21.—Isopleths of average sea temperatures, 0–150 meters, 4–8 April 1966.

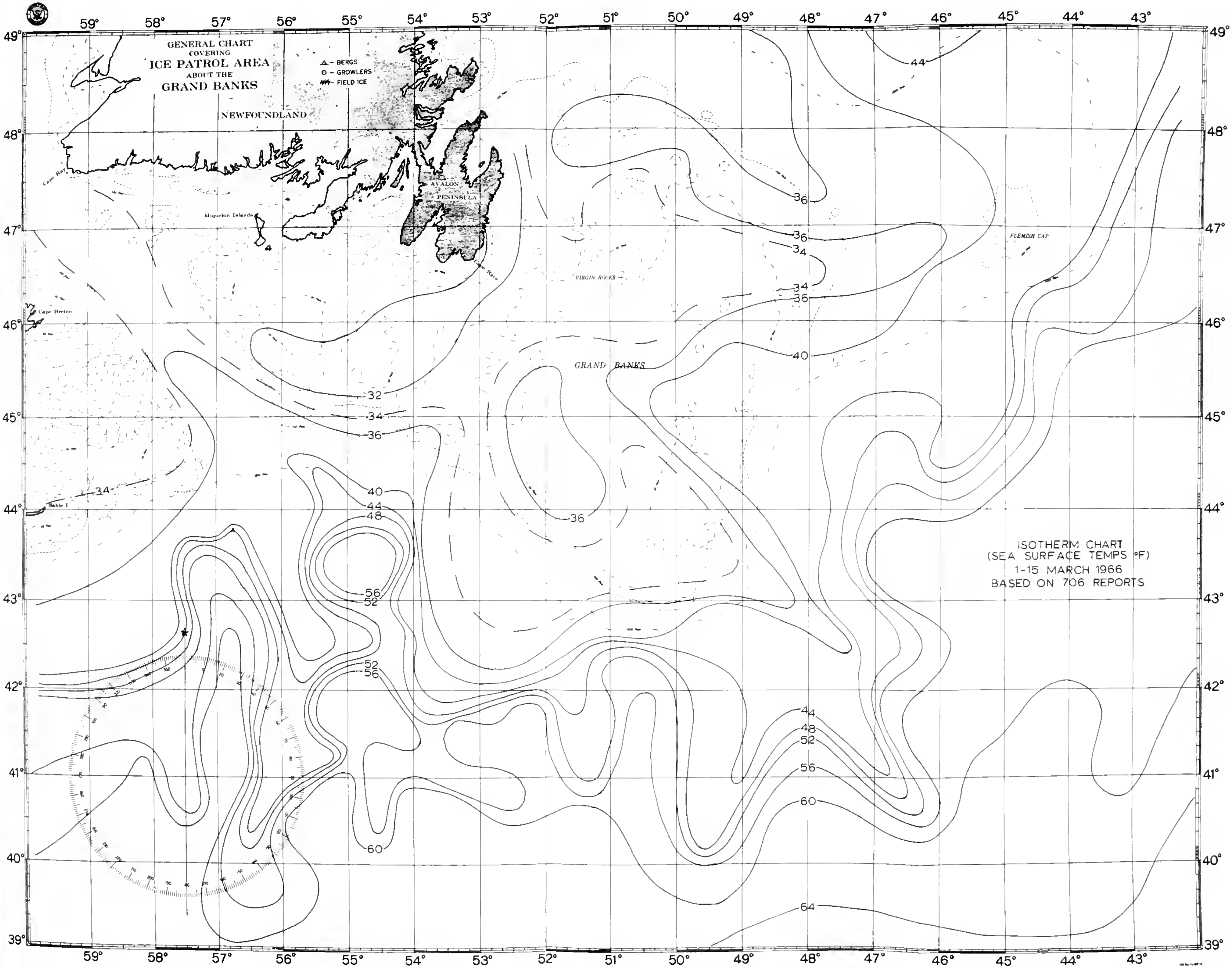

FIGURE 22.—Sea surface isotherms—1–15 March 1966.

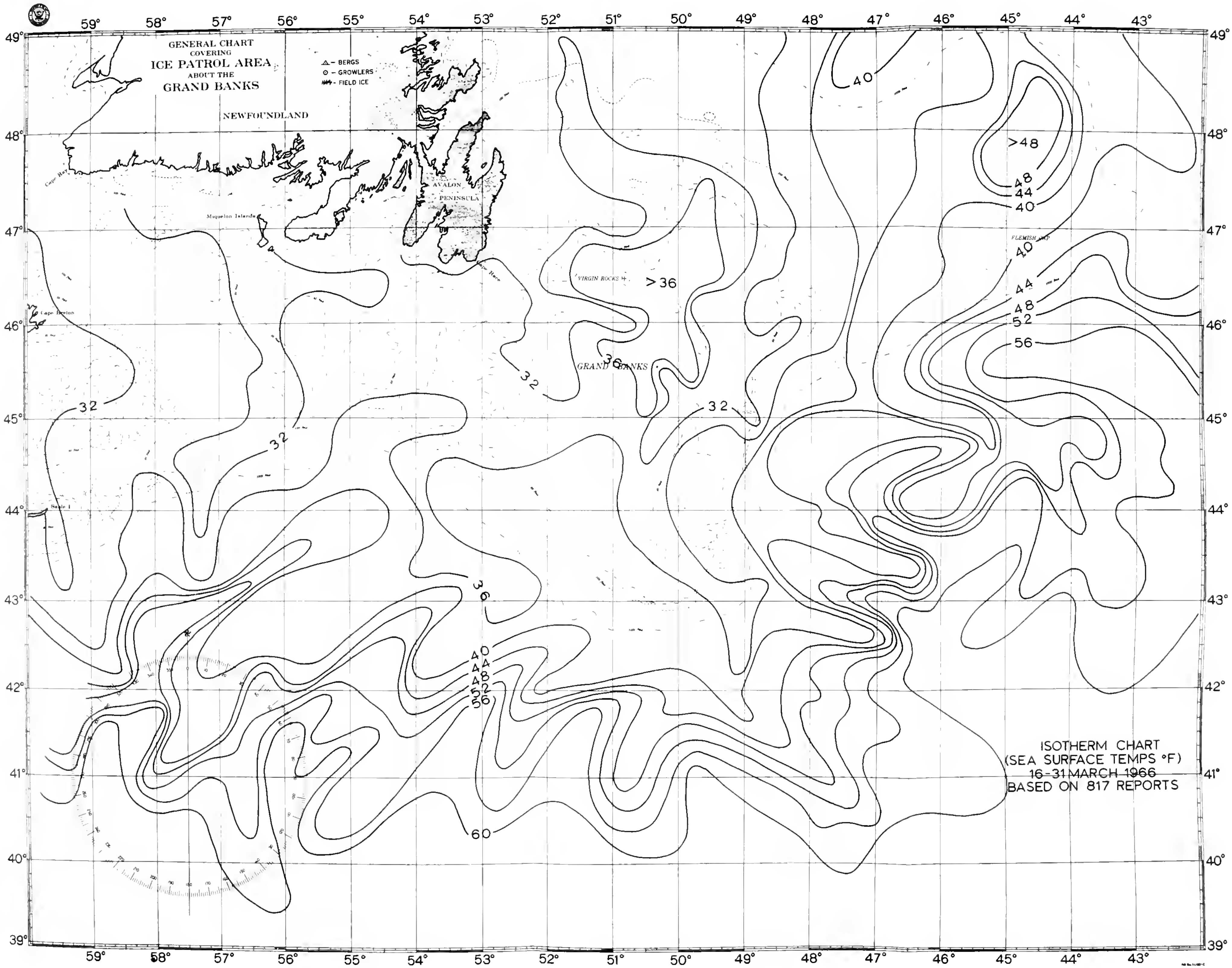

FIGURE 23.—Sea surface isotherms—16–31 March 1966.

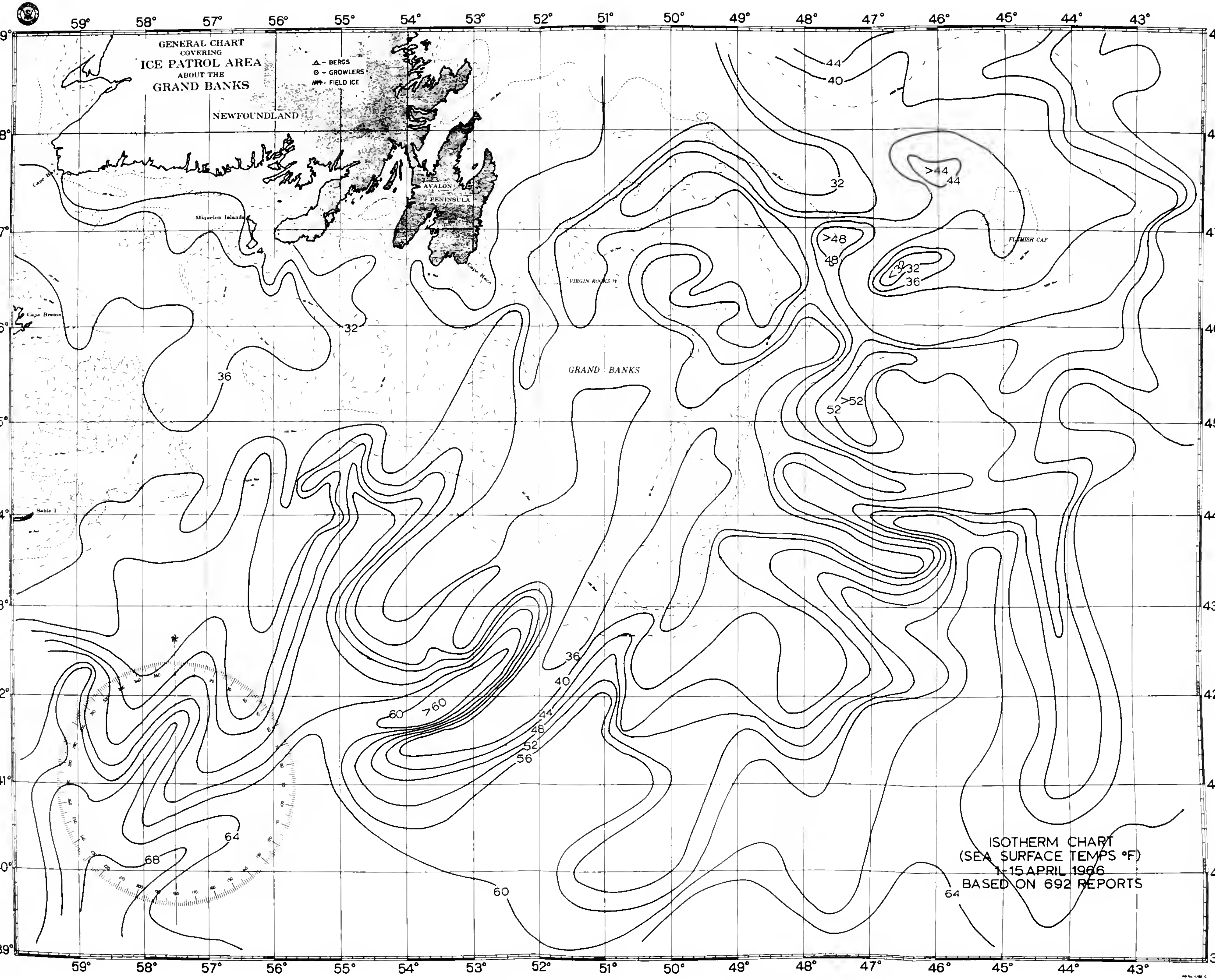

FIGURE 24.—Sea surface isotherms—1-15 April 1966.

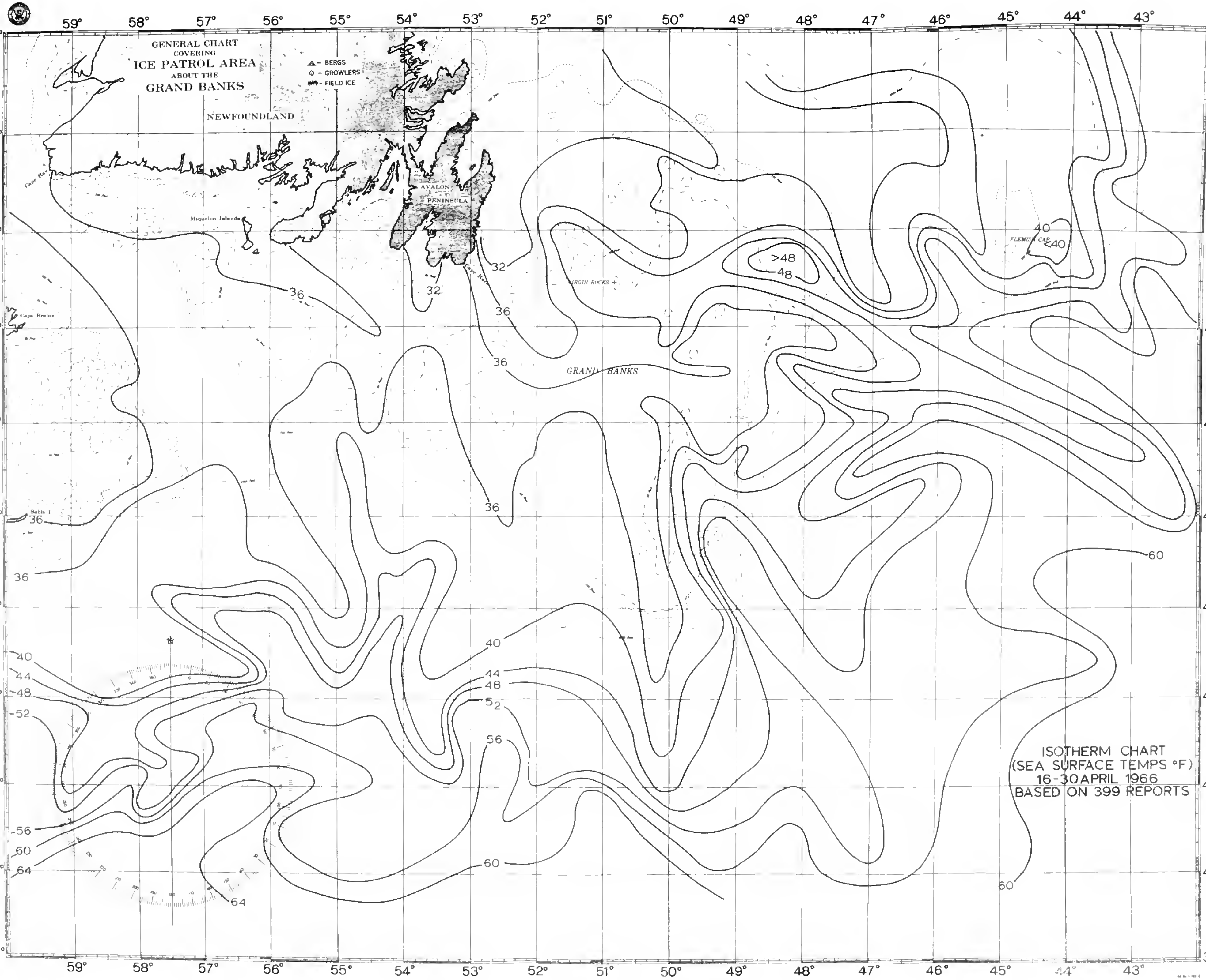

FIGURE 25.—Sea surface isotherms—16–30 April 1966.

assumes that the climatology north of Hopedale is generally cold enough to preclude any extensive berg deterioration through April. South of this point a major change in climatology will greatly affect berg environmental conditions. Any excessive warning will hasten pack ice deterioration and increase the sea temperatures with attendant increase in berg deterioration. Any excessive cooling will prevent pack ice deterioration and in some cases cause ice formation and inhibit increase in sea temperatures through insulation. The berg environment then is preferential for berg retention.

The obvious conclusion is that any satisfactory berg forecast for a forthcoming season is greatly dependent on climatic conditions existing south of Hopedale for the months of February, March, April, and May. Hence, only when long range weather forecasting becomes available can accurate forecasts be made. In the interim period, berg forecasts based on the monthly Weather Bureau Surface Pressure forecasts must continue to be used to continuously update the initial estimate based on the available berg potential.

Ice and weather reports

[By country]

Vessel	Weather reports	Ice reports
BELGIUM		
SS *Frubel Europa*	1	
SS *Gloria*	1	
SS *Lindi*	2	
SS *Loveral*	1	
SS *Lukuga*	3	
SS *Lufira*	4	
SS *Lulua*	2	
CANADA		
CCGS *J. A. McDonald*	3	
SS *John Cabot*	1	
SS *Provider*	11	
DENMARK		
SS *Regina Maersk*		
SS *Chastine Maersk*		
SS *Anita Dan*		1
FINLAND		
SS *Finnelipper*		
FRANCE		
SS *Commandant Bourdais*	73	15
FRANCE—con.		
SS *Cavalier La Salle*	2	
SS *Chicago*	4	
SS *Longway*	3	
SS *Stigmaria*	2	
SS *Washington*	10	
SS *Le Moyne Diberville*	2	
SS *Winnipeg*	2	
SS *France*	16	
SS *Rocroi*	4	
GERMANY		
SS *Carl Trautwein*	1	
SS *Marie Leonhardt*	3	
SS *Irmgard Horn*	1	
SS *Transamerica*	5	
SS *Ilse Schulte*		
SS *Nabob*	1	
SS *Berlin*	32	
SS *Naumberg*	10	
SS *Tubingen*	4	
SS *Gottingen*	4	
SS *Leada*	1	
SS *Transpacific*	2	
SS *Uranus*	6	
SS *Bernard Howaldt*	6	

Ice and weather reports—Continued

[By country]

Vessel	Weather reports	Ice reports
GERMANY—con.		
SS *Rotersand*	4	
SS *Bishofstor*	1	
SS *Breitenstein*	1	
GHANA		
SS *Offin River*	4	
GREECE		
SS *Queen Fredricka*	3	
SS *Queen Anna Maria*	1	
SS *Amazon*	3	
IRELAND		
SS *Irish Spruce*	1	
ISRAEL		
SS *Shalom*	1	
SS *Mezada*	3	
ITALY		
SS *Raffaello*	2	
SS *Giovanai Grimaldi*	6	
SS *Christoforo Columbo*	4	
SS *Leonardo DaVinci*	2	
SS *Michael Angelo*	1	
LIBERIA		
SS *Ore Transport*	1	
SS *Arrow*	3	
SS *Cuyama Valley*	1	
SS *Virginia Getty*	1	
SS *World Citizen*		
SS *West River*	3	
SS *Otto N. Miller*	1	
NETHERLANDS		
SS *Alamak*	2	
SS *Alblasserdyk*	1	
SS *Alkes*		
SS *Alnitak*	2	
SS *Anco Spray*	4	
SS *Aristoteles*	1	
SS *Asterope*	1	
SS *Baarn*	2	
NETHERLANDS—con.		
SS *Balong*	5	
SS *Bengkalis*	1	
SS *Bintang*	2	
SS *Colytto*	7	
SS *Diemerdyk*	1	
SS *Dinteldyk*	1	
SS *Gaasterdyk*	6	
SS *Gorredyk*	1	
SS *Grebbedyk*	1	
SS *Holdendrecht*	2	
SS *Kamperdyk*	6	
SS *Katsedyk*	9	
SS *Kerkedyk*	16	
SS *Kinderdyk*	1	
SS *Kloosterdyk*	1	
SS *Korendyk*	3	
SS *Maasdam*	17	
SS *Meerdrecht*	8	
SS *Moerdyk*	1	
SS *Nieuw Amsterdam*	3	
SS *Noorwijk*	1	
SS *Poeldyk*	1	
SS *Pres. J. V. Wierdsma*	1	
SS *Prinses Margriet*	1	
SS *Statendam*	4	
SS *Roebiah*	1	
SS *Soestdyk*	7	
SS *Ryndam*	2	
SS *Schiedyk*	8	
SS *Sloterdyk*	8	
NORWAY		
SS *Sighansa*	6	
SS *Vibeke*	1	
SS *Topdalsfjord*	5	
SS *Fernwind*	2	
SS *Grindefjill*		1
SS *Foldenfjord*	11	2
SS *Havtroll*	2	
SS *Havjo*	5	
SS *Oslofjord*	14	
POLAND		
SS *Sniadncki*	3	
SS *Romer*		

Ice and weather reports—Continued

[By country]

Vessel	Weather reports	Ice reports
SPAIN		
SS *Covadonga*	2	------
SS *Virginia D. Churka*	1	------
SWEDEN		
SS *Alta*	3	------
SS *Minnesota*	5	------
SS *Laidaure*	2	------
SS *Odenholm*	10	------
SS *Adak*	8	------
SS *Avafors*	1	------
SS *Arvidsjaur*	18	------
SS *Gripsholm*	2	------
SS *Aurivaara*	3	------
UNION OF SOVIET SOCIALIST REPUBLICS		
SS *Krasnozavodsk*	------	------
SS *Astrakhan*	1	------
SS *Krishyania Valdemar*	------	------
Radio call signs:		
UBLO	1	------
UYZX	1	------
UYZY	1	------
UNITED KINGDOM		
SS *Gladys Bowater*	8	4
SS *Cairnesk*	4	1
SS *City of Melbourne*	7	------
SS *Rialto*	1	------
SS *Suneck*	2	------
SS *Manchester Regiment*	3	------
SS *Santona*	6	------
SS *Asperella*	2	------
SS *Cairnglen*	16	------
SS *Newfoundland*	22	2
SS *Andania*	4	------
SS *Alaunia*	14	------
SS *Brighton*	1	------
SS *Alert*	1	1
SS *Custodian*	1	------
SS *Nina Bowater*	6	------
SS *Empress of Canada*	5	------
SS *Photinia*	4	------
SS *Dukesgarth*	2	------
UNITED KINGDOM—con.		
SS *Booker Venture*	1	------
SS *Sheridan*	2	------
SS *Sidonia*	1	------
SS *Beaver Fir*	10	------
SS *Forebank*	11	------
SS *Torr Head*	11	------
SS *Beaver Pine*	1	------
SS *Ebro*	14	------
SS *Montreal*	3	------
SS *Beaver Elm*	5	------
SS *Marengo*	1	------
SS *BeaverAsh*	12	
SS *Manchester Commerce*	9	------
SS *Ivernia*	1	------
SS *Media*	9	------
SS *Parthia*	1	------
SS *Saxonia*	16	------
SS *Manchester Renown*	6	------
SS *Halifax City*	3	------
SS *Laurentia*	12	------
SS *Scythia*	19	------
SS *Lismoria*	18	------
SS *Beaver Oak*	1	------
SS *Roonagh Head*	1	------
SS *Manchester Spinner*	5	------
SS *Sameria*	13	------
SS *Bassano*	4	------
SS *Manchester England*	18	------
SS *Manchester Exporter*	6	------
SS *Inishowen Head*	1	------
SS *Sicilia*	18	------
SS *Cotswald*	1	------
SS *London Splendour*	1	------
SS *Coventry City*	1	------
SS *Woldingham Hill*	9	------
SS *Mountpark*	9	------
SS *Baskerville*	------	1
SS *Manchester Port*	1	------
SS *Gloucester City*	6	------
SS *Manchester Mariner*	5	------
SS *Manchester Trader*	1	------
SS *Franconia*	9	------
SS *Scotia*	1	------
SS *Alsatia*	1	------
SS *New York City*	8	------
SS *Carinthia*	4	------

Ice and weather reports—Continued

[By country]

Vessel	Weather reports	Ice reports
UNITED KINGDOM—con.		
SS *Sylvania*	10	------
SS *Esso Durham*	1	------
SS *Humilaria*	3	------
SS *Draxford*	17	------
SS *Constance Bowater*	5	------
SS *Carrigan Head*	4	------
SS *Manchester Freighter*	2	------
SS *Manchester Miller*	2	------
SS *Manchester Shipper*	1	------
SS *Ramore Head*	4	------
SS *Manchester Merchant*	1	------
UNITED STATES OF AMERICA		
SS *Constitution*	2	------
SS *African Planet*	2	------
SS *Marjorie Lykes*	1	------
SS *American Clipper*	4	------
SS *American Forwarder*	3	------
SS *American Importer*	3	------
SS *American Leader*	8	------
SS *American Manufacturer*	30	------
SS *American Merchant*	4	------
SS *American Press*	5	------
SS *American Scout*	20	------
SS *American Shipper*	1	------
SS *American Traveler*	5	------
SS *American Veteran*	1	------
SS *City of Alma*	3	------
SS *Exbrook*	2	------
SS *Chatham*	17	------
SS *Steel Voyager*	3	------
SS *John B. Waterman*	2	------
SS *American Racer*	2	------
SS *American Ranger*	6	------
SS *American Reliance*	8	------
SS *American Rover*	6	------
SS *Madaket*	2	------
SS *Keystone State*	14	------
SS *Wolverine State*	19	------
SS *Mormac Gulf*	5	------
SS *Mormac Mail*	13	------
SS *American Pilot*	3	------
SS *Expeditor*	2	------

Vessel	Weather reports	Ice reports
UNITED STATES OF AMERICA—con.		
SS *Pioneer Cove*	8	------
SS *American Forrester*	1	------
SS *American Harvester*	1	------
SS *American Reporter*	1	------
SS *American Courier*	4	------
SS *Helen D*	1	------
SS *Steel Navigator*	1	------
SS *Export Adventurer*	1	------
SS *William F. Humphrey*	1	------
SS *Sapphire Gladys*	7	------
SS *Mormac Oak*	2	------
SS *Hurricane*	1	------
SS *Exemplar*	2	------
SS *Export Aide*	1	------
SS *Export Commerce*	1	------
SS *American Crusader*	11	------
SS *American Corsair*	5	------
SS *Export Challenger*	2	------
SS *American Commander*	------	------
SS *Columbia Victory*	------	------
SS *Export Champion*	1	1
SS *American Challenger*	24	------
SS *American Champion*	2	------
SS *Mormacargo*	2	------
SS *Mormac Vega*	1	------
SS *Mormacdrago*	9	------
SS *Mormac Rigel*	2	------
SS *Mormac Altair*	4	------
SS *Flying Spray*	1	------
SS *Explorer*	3	------
SS *Ulua*	16	------
UNITED STATES GOVERNMENT		
U.S. COAST GUARD		
USCGC *Chincoteague*	4	------
USCGC *Barataria*	9	1
USCGC *Casco*	------	------
USCGC *Bibb*	1	------
USCGC *Campbell*	------	10
USCGC *Owasco*	1	------
USCGC *Mendota*	6	------
USCGC *Evergreen*	104	------
USCGC *Mackinac*	------	------

Ice and weather reports—Continued

[By country]

Vessel	Weather reports	Ice reports
U.S. NAVY		
USNS *Norwalk*	24	------
USNS *Alexander M. Patch*	39	------
USNS *General William O. Darby*	14	------
USNS *General S. B. Buckner*	49	------
U.S. NAVY—con.		
USNS *General M. Rose*	47	------
USNS *Geiger*	15	------
USNS *Lieutenant G. Boyce*	1	------
USNS *Blue Jacket*	3	------
USNS *Sgt. M. Crain*	19	------
USNS *Mirfak*	13	------

U.S. GOVERNMENT PRINTING OFFICE 1968 O—334-389

COAST GUARD

BULLETIN NO. 53

Report of the International Ice Patrol Service in the North Atlantic Ocean

SEASON OF 1967

CG–188–22

DEPARTMENT OF TRANSPORTATION
UNITED STATES COAST GUARD

Address reply to:
COMMANDANT (OMS)
U.S. COAST GUARD
WASHINGTON, D.C.
20591

Transmitted herewith is Bulletin No. 53, Report of the International Ice Patrol Service in the North Atlantic Ocean, Season of 1967.

Dist: (SDL 89)
A: abcdefghmuv(1)
B: a(250), b(50 CEA, 5 CWA), e(10), cgq(2), mn(1)
C: abc(1)
D: s(35), i(2), lux(1)
E: None
F: None
SML: 133

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PREFACE

This Bulletin is No. 53 in a series of annual reports on the International Ice Observation and Ice Patrol Services and for the first time is reported on a season to season basis rather than on a calendar basis. The authority for the mission, forces assigned, and method of operation of the International Ice Patrol during the 1967 season are described.

Aerial ice observations and communication statistics are provided.

All ships reporting ice and weather to the International Ice Patrol in 1967 are tabulated. Figures illustrating the ice conditions for the Grand Banks are included. Four hundred and forty one bergs drifted south of Latitude 48°N. during the season. The most southerly berg of the season was reported on 23 May 1967 in position 43°15′ N., 49°32′ W. The duration and extension of the pack ice to the south and east of Newfoundland was below normal except along the east coast of the Avalon Peninsula where St. John's harbor was on occasion completely blocked by pack ice.

Pre-season activities, including the 1966 northern ice surveys are illustrated.

Rear Admiral J. A. ALGER, JR., U.S.C.G. was Commander, International Ice Patrol. Commander J. E. MURRAY, U.S.C.G. was directly responsible for the management of the Patrol.

The author of this bulletin, Commander J. E. MURRAY, U.S.C.G. acknowledges the assistance provided in the preparation of the illustrations and manuscript by Chief Aerographer's Mate W. F. VAN GAASBECK, U.S.C.G. and Yeoman First Class H. M. KERN, U.S.C.G.

INTERNATIONAL ICE PATROL—1967

The International Ice Patrol Service for 1967 was carried out by the U. S. Coast Guard in accordance with the provisions of the International Convention for the Safety of Life at Sea, 1960 and the United States Code, Title 46, Sections 738, 738a through 738d. The mission of protecting shipping was accomplished by the collection of ice information from all available sources and by means of twice daily radio broadcasts and daily facsimile broadcasts disseminating to shipping the description of current ice conditions.

The Commander, International Ice Patrol had the following facilities available to him during the ice season: a staff of three officers and sixteen enlisted men; radio and landline communications of Coast Guard Radio Station NIK; Hercules HC–130B reconnaissance aircraft support provided by the U. S. Coast Guard Air Station, Elizabeth City, North Carolina; a surface patrol vessel, the U.S.C.G.C. *Acushnet;* and an oceanographic survey vessel, the U.S.C.G.C. *Evergreen.* The distribution of ice made it unnecessary to utilize a surface patrol vessel for the eighth consecutive year.

This was the first year that the Commander, International Ice Patrol, also the Commander, Eastern Area was permanently stationed at New York, New York. Operation of the Ice Patrol was accomplished by deployment of ice observation forces to Argentia, Newfoundland prior to the commencement of the ice season.

Ice Patrol forces deployed to Argentia on 20 February 1967. Included were aircraft and crews, ice observers, and support personnel. The Ice Observer's Office, Argentia, Newfoundland was established, new communication links with the Commander, International Ice Patrol, Governor's Island, New York were tested and put into use, and pre-season flights were initiated. The International Ice Patrol Radio Station (NIK) was manned with additional personnel and readied for the forthcoming season.

Control of the Ice Patrol remained with its Commander at Governor's Island. There, the Ice Patrol staff directed all flights, received all ice observations and reports, maintained all ice plots, prepared the ice broadcasts, and based on meteorological and oceanographic data, forecast ice conditions. Periodically throughout the season, the Ice Patrol Officer deployed to Argentia for first hand observation of the existing ice conditions.

Pre-season aerial ice reconnaissance indicated a light ice season but as the season progressed favorable wind and current conditions drifted many more bergs south of 48°N. than were expected. Figures 2 through 18 illustrate the development of the extension of ice onto the Grand Banks. On 16 March, the first ice was observed on the Grand Banks. The first of fifty-seven ice observation flights was flown on 25 February 1967. Radio broadcast of the twice daily ice broadcasts to shipping was commenced at 1248 G.M.T., 10 March 1967.

The radio broadcasts were also sent via landline to the U.S. Naval Oceanographic Office, the Canadian Department of Transport, R.C.N. Radio Station Albro Lake, and others for further dissemination.

The sources of ice information during the Ice Patrol season were the ice observation flights made by International Ice Patrol aircraft, reports made by commercial and military vessels and aircraft, ice reconnaissance flights by the Canadian Department of Transport in the Gulf of St. Lawrence and Newfoundland coastal waters, by the Danish Commander-in-Chief, Greenland for Greenland waters and other contributors. Merchant ship reports on weather and ice conditions were an extremely important source of information.

The operation of the Ice Patrol from September 1966 to August 1967 can be summarized as follows:

1. Three Ice Patrol iceberg census flights were flown for the purpose of assessing the

berg potential for the forthcoming season.

2. One pre-season Ice Patrol reconnaissance flight was flown for the purpose of preventing undetected encroachment of ice onto the Grand Banks.

3. Fifty-seven Ice Patrol reconnaissance flights were flown for the main purpose of guarding the southern, southeastern, and southwestern limits of all known ice on the Grand Banks.

4. Ice reports were collected from ships, aircraft, and other ice observing agencies.

5. Weather reports, including sea surface temperatures, were collected from ships and all sea surface temperatures in the weather observations addressed to METEO, Washington, in the area of Ice Patrol interest, were plotted.

6. Ice information was plotted and analyzed.

7. Ice conditions were forecast twice daily during the periods between observations of ice conditions.

8. Ice advisory broadcasts were made twice daily to shipping and transmitted twice daily to interested agencies.

9. Facsimile transmissions were made once daily to shipping.

10. Special ice information was provided on request.

11. Position plots were maintained of all reporting ships in the Ice Patrol area. The AMVER computer provided a daily SURPIC to the Ice Patrol.

12. Two oceanographic cruises were conducted between 30 March and 28 May to collect oceanographic data affecting the drift and deterioration of ice.

The U.S.C.G.C *Evergreen* made the oceanographic surveys in the critical areas of the Grand Banks during the ice season and conducted studies into the drift and deterioration of bergs. By means of current and mean isotherm charts from the surveys, semi-monthly isotherm charts prepared from sea surface temperatures reported by shipping, and wind field data supplied by the Aerology Section attached to the Ice Patrol estimates of set, drift, and deterioration of bergs and field ice were made and a current 12 hourly plot of ice conditions was maintained. This plot, and forecasted estimates of ice conditions, was used to plan ice reconnaissance flights and in issuing the radio broadcasts. They were the only means to determine ice conditions after extended periods of poor visibility when no visual ice observations could be made. For a detailed discussion of oceanography in this area, refer to the U.S. Coast Guard Oceanographic Report, Series CG-373, for this year.

A total of 441 bergs drifted south of latitude 48°N. in the Grand Banks from September 1966 through and past the end of the Ice Patrol season in August 1967, compared with the 1900-1967 average of 373.

Ice conditions are described under the heading of that name and in Figures 1 through 19.

Dissemination of ice information by the International Ice Patrol ceased on 14 July 1967. By that time there were only a few bergs to the north and they were too far north to survive the southward trip into the shipping lanes traversing the Grand Banks. No post-season ice reconnaissance flights were required.

Table 1.—**Estimated Number of Icebergs South of 48°N., 1900-1967.**

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Total 1900-1945	118	447	2101	4811	7156	3486	1199	397	347	107	106	80	20,255
Total 1946-1966	10	87	561	1731	1219	809	200	8	1	2	4	5	4,637
Total 1967	0	0	25	134	209	65	8	0	0	0	0	0	441
Averages 1946-1967	0.5	4.0	26.6	84.8	64.9	39.7	9.5	0.4	0.0	0.1	0.2	0.2	227.3
Average 1900-1967	1.9	7.8	39.5	98.2	126.2	64.1	20.7	6.0	3.6	1.6	1.6	1.2	373

Note:
1. Total 1946-1967 are based mainly on Ice Patrol aircraft reconnaisance with heavy reliance on visual sightings.
2. Total for 1900-1945 are based mainly on ship reports of other than Ice Patrol vessels.

AERIAL ICE RECONNAISSANCE

Fifty-seven ice observation flights were made by Lockheed Hercules (HC-130B) aircraft deployed to Argentia, Newfoundland by the United States Coast Guard Air Station, Elizabeth City, North Carolina during the ice season. The primary objective of the aerial ice reconnaissance was to guard the southeastern, southern, and southwestern limits of ice in the general area of the Grand Banks, and specifically these limits in the areas of the Transatlantic Steamship Tracks except for Track G (Strait of Belle Isle). Frequent aerial ice reconnaissance permitted continuous surveillance of all ice and permitted up-to-date information to be disseminated to shipping. The ice reports received from shipping were an invaluable addition in attaining these objectives.

Figures 2 through 19 illustrate flights conducted by the Ice Patrol aircraft selected to show the best ice information available on a weekly basis.

Radar aided the ice observers in locating ice and when used in conjunction with the microwave radiometer (model AN/AAR-33) installed on the aircraft enabled identifying the radar targets as ships or icebergs. Excellent correlation was attained with this device although the one element of real uncertainty was its inability to differentiate fishing vessels (wooden) from icebergs.

Flight statistics for the season are presented in Table 2.

Table 2.—Aerial Ice Reconnaissance Statistics—1967

Month	No. of flights	Number of days flights made	Number of days good visibility (1)	Average visual effectiveness (percentage) (2)	Maximum number days between flights	Hours flown
Jan	1	NA	NA	40.0	NA	19.8
Feb	3	3	3	69.0	4	18.5
Mar	9	9	20	69.0	4	56.9
Apr	13	13	12	54.0	5	80.0
May	12	10	16	79.6	8	62.0
Jun	18	18	21	87.0	5	84.9
Jul	4	4	12	25.0	4	19.7

Notes:
(1) Days on which possible to search visually at least 50 percent of the search area with 25 mile spacing between legs of flight plan.
(2) Ratio (X 100) of area actually searched visually to area planned to be searched.

COMMUNICATIONS

From 10 March to 14 July ice information was broadcast twice daily to shipping by U. S. Coast Guard Radio Station (NIK) at 0048 and 1248 G.M.T. simultaneously on 155, 427, 5320, 8502, and 12880.5 KHZ. Each broadcast was preceded by the general call CQ on 500 KHZ with instructions to shift to the above operating frequencies. A two minute series of test signals transmitted on the operating frequencies facilitated receiver tuning. Each broadcast was transmitted twice, once at 15 words per minute and again at 25 words per minute. Prescribed radio silent periods were observed. Ice Bulletins were also sent via teletype to the U. S. Naval Oceanographic Office, Washington, D. C. for further dissemination twice daily by U. S. Naval Radio Station Washington (NSS) on their regular daily "HYDRO" broadcasts, for inclusion of a daily ice chartlet in the daily memorandums, and for a weekly ice chartlet. Ice Bulletins were also sent to the Canadian Department of Transport, R.C.N. Radio Station Albro Lake, N.S.; and others for further dissemination.

Ice conditions were also transmitted by facsimile at 1330 G.M.T. daily on 5320, 8502, and 12880.5 KHZ.

Duplex radio operations were used between NIK and merchant ships for general radio communications. Merchant ships worked NIK on 500 KHZ and 8 and 12 KHZ maritime calling bands. NIK worked 427, 8734, or 12718.5 KHZ as appropriate.

During the 1967 season, CG Radio Station Argentia (NIK), the Ice Patrol radio station, handled 3071 radio messages and 12,809 landline messages of which 253 were ice broadcasts and 253 were teletype ice bulletins. Statistics concerning the reports received from shipping during the ice season are as follows:

Number of ice reports received from vessels	569
Number of vessels furnishing ice reports	211
Number of sea surface temperatures reported	3,194
Number of vessels furnishing sea surface temperatures	285
Number of vessels requesting special information	34

The percentage distribution of reporting vessels by nationality was as follows:

United Kingdom	25.4
United States of America	20.6
Federal Republic of Germany	10.5
Netherlands	8.9
Norway	6.6
France	3.3
Sweden	2.9
Belgium	2.5
Canada	2.2
Liberia	2.2
Italy	1.8
Israel	1.7
Denmark	1.5
Greece	1.5
Union of Soviet Socialist Republics	1.4
Yugoslavia	1.4
Ireland	1.2
Poland	1.1
India	0.7
Finland	0.6
Japan	0.5
Portugal	0.3
Spain	0.3
Argentina	0.1
Honduras	0.1
Iceland	0.1
Jamaica	0.1
Mexico	0.1
Nigeria	0.1
Pakistan	0.1
Panama	0.1
Venezuela	0.1
Total	100.0

OBSERVED ICE CONDITIONS

In prior bulletins, monthly ice conditions and monthly ice charts were included. Beginning with this bulletin, these will be dispensed with and ice conditions will be provided in the form of charts of ice conditions observed by the Ice Patrol. During the period, commencing with the deployment of Ice Patrol forces to Argentia on 20 February 1967, the charts provide ice conditions in approximately weekly intervals. In addition, those Ice Patrol reconnaissance flights conducted throughout the remainder of the year are included. These are the September and December berg census flights and the January pre-season ice reconnaissance flight.

No flights were conducted in October and November 1966.

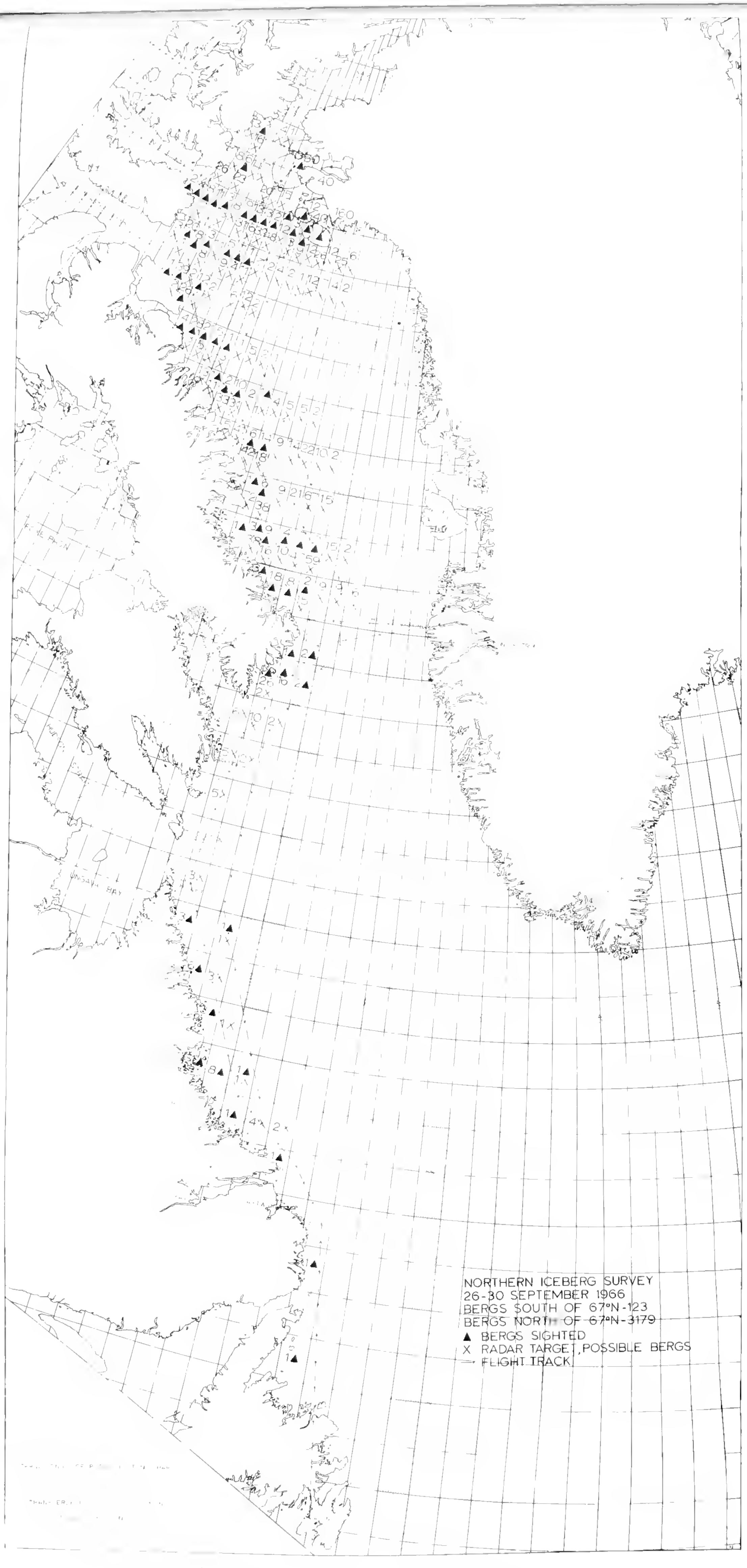


Figure 1 —Ice Conditions, Labrador Sea and Western Baffin Bay, 26 30 September 1966

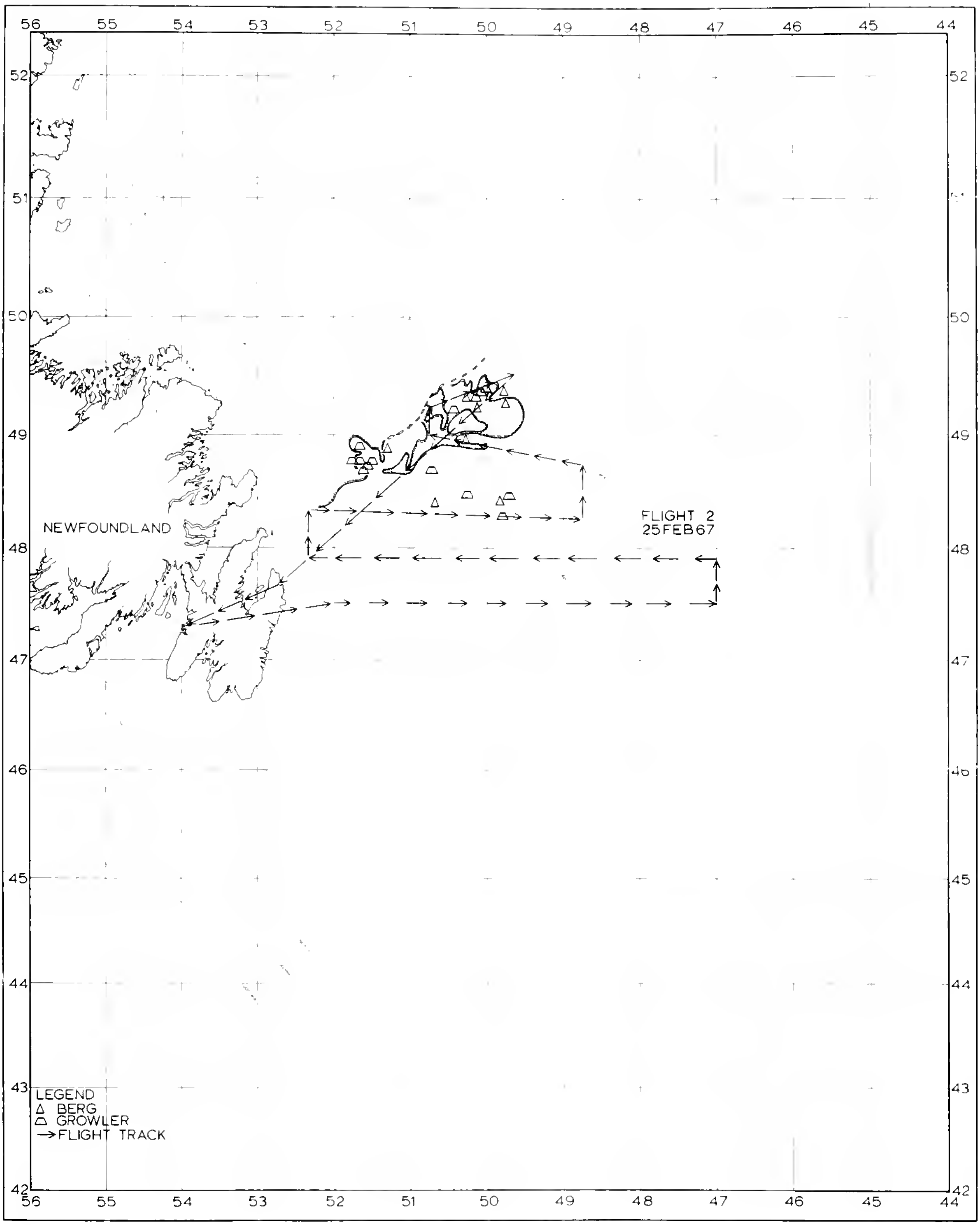


Figure 2.—Ice Conditions, 25 and 26 February 1967.

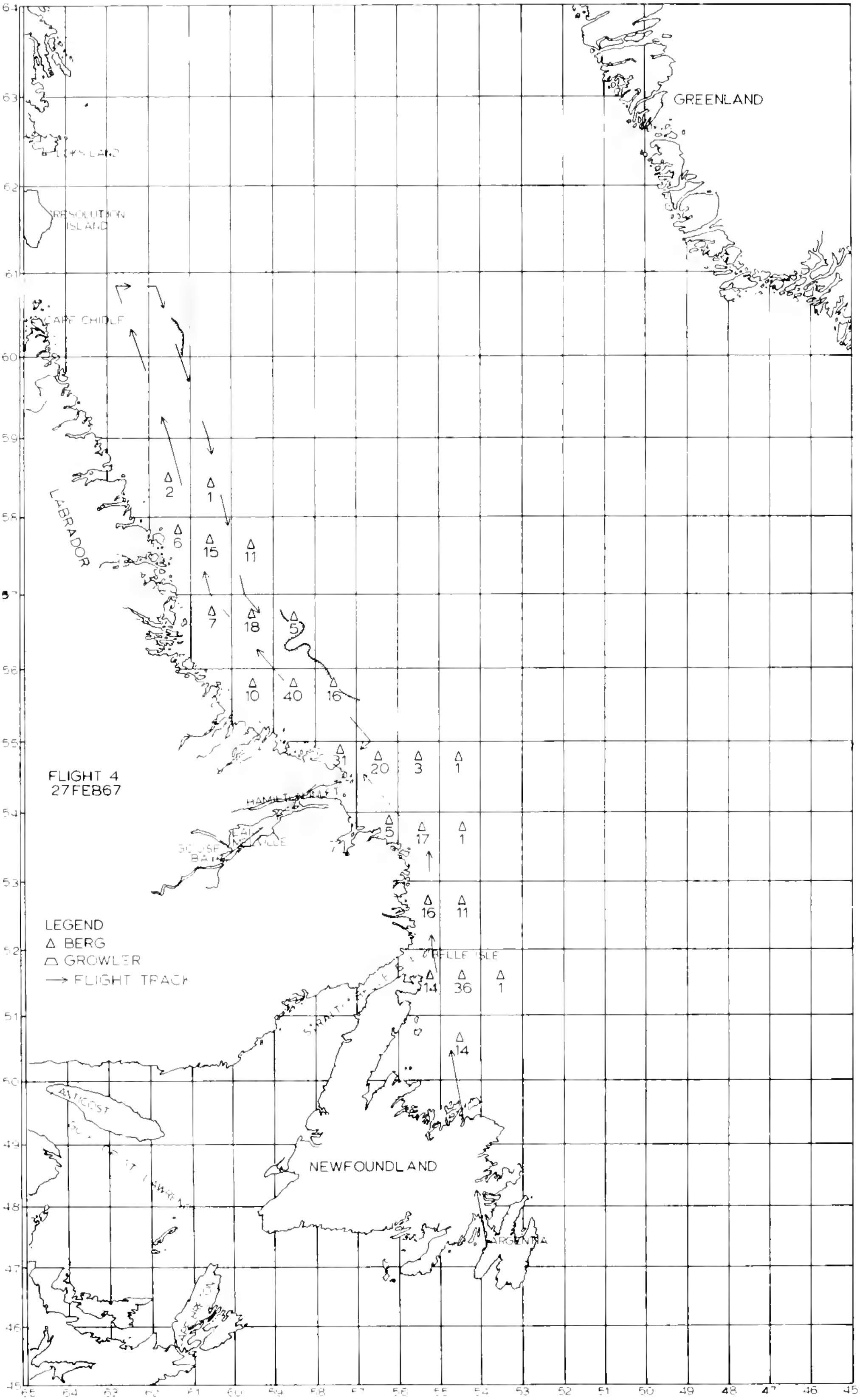


Figure 3.—Ice Conditions Strait of Belle Isle to Cape Chidley, 27 February 1967.

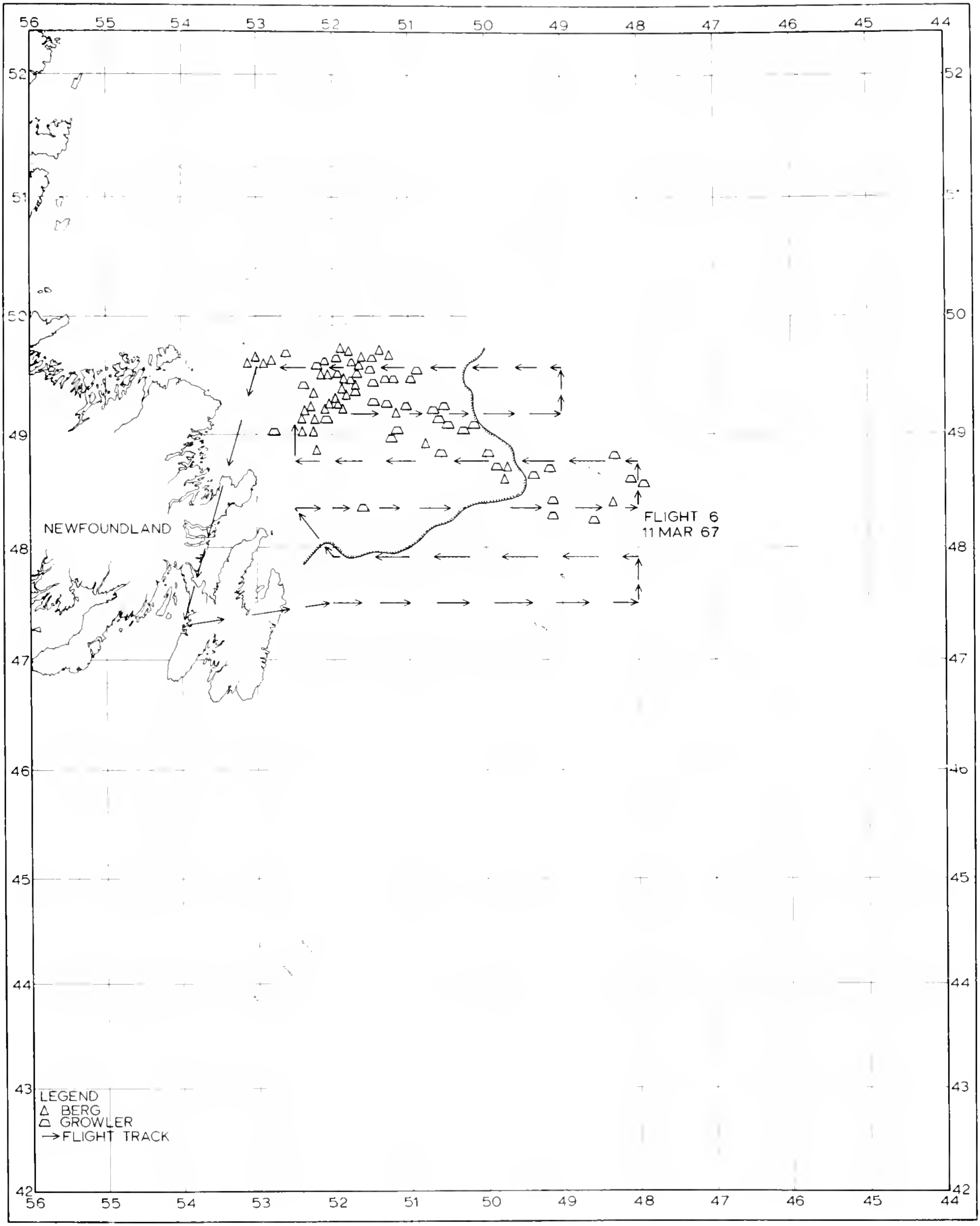


Figure 4.—Ice Conditions, 11 and 12 March 1967.

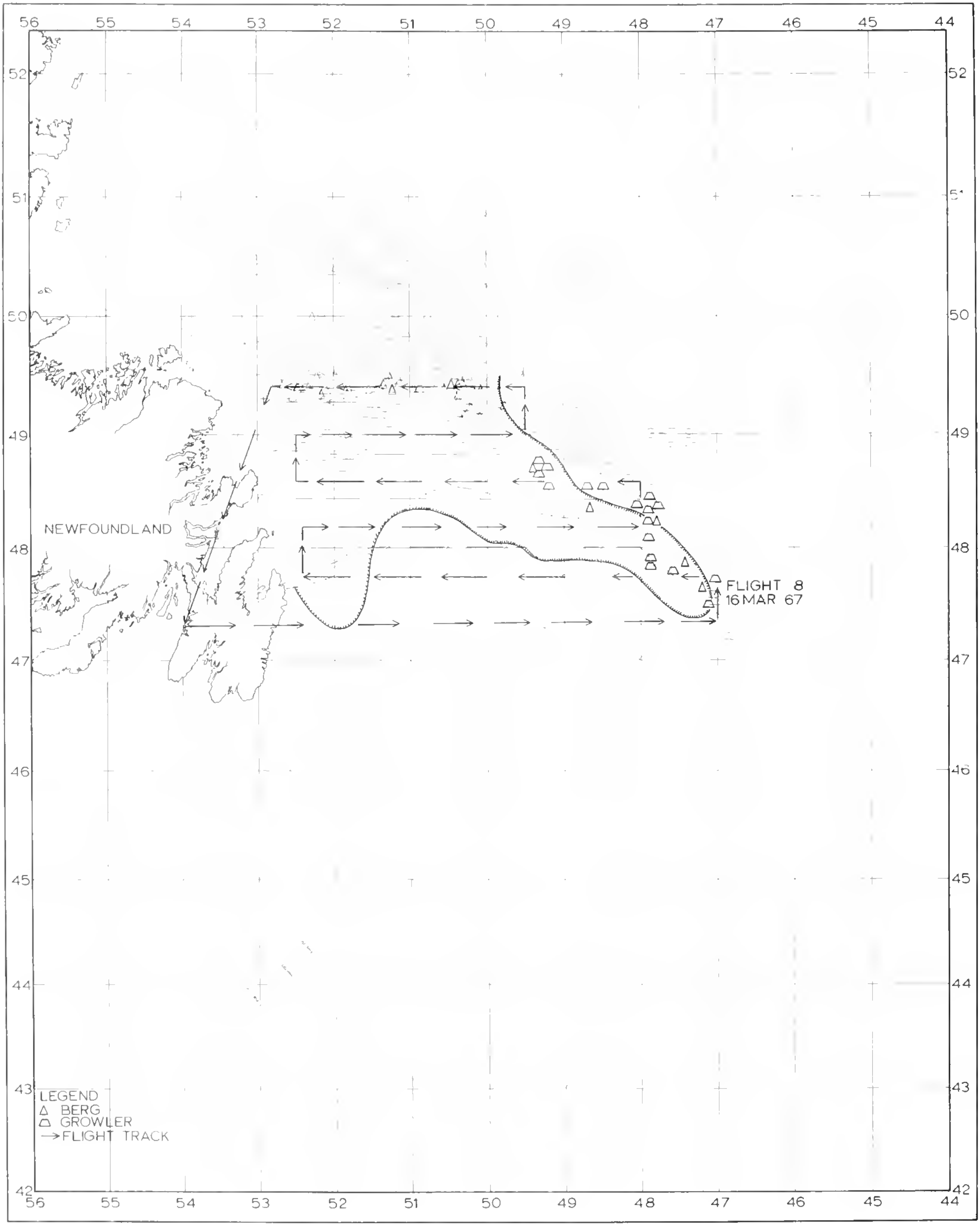


Figure 5.—Ice Conditions, 16–21 March 1967.

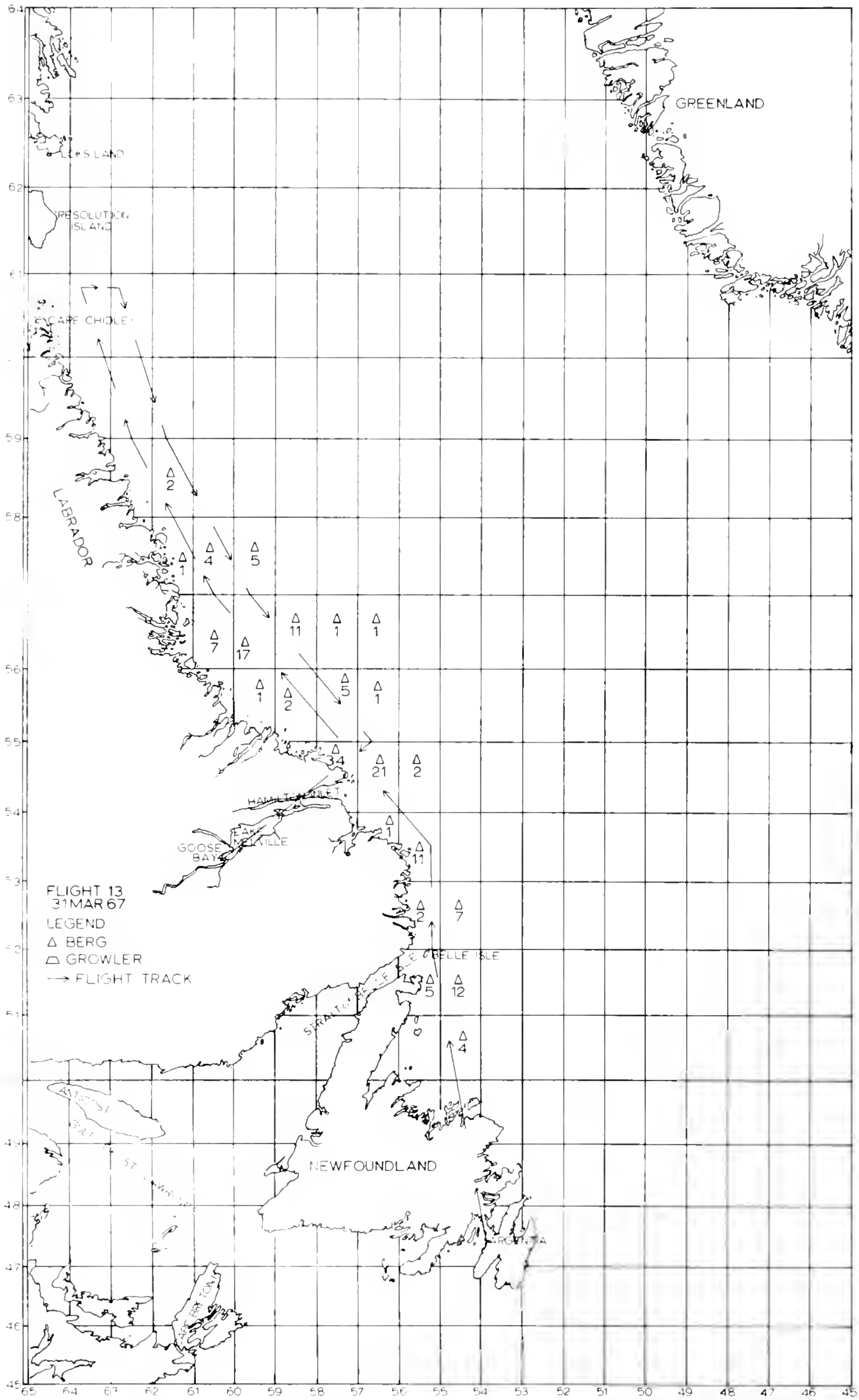


Figure 6.—**Ice Conditions Strait of Belle Isle to Cape Chidley, 31 March 1967.**

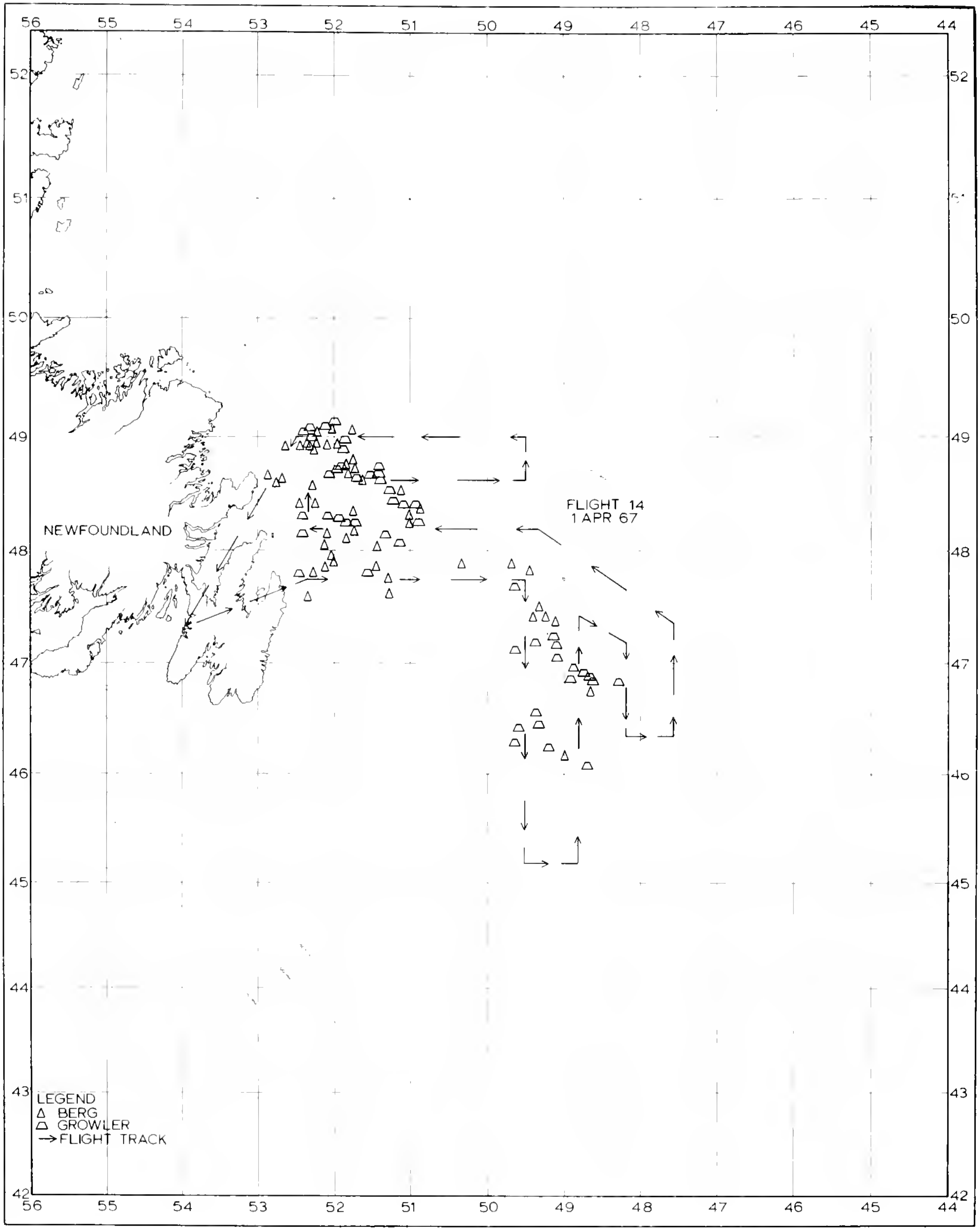


Figure 7.—Ice Conditions, 1 April 1967.

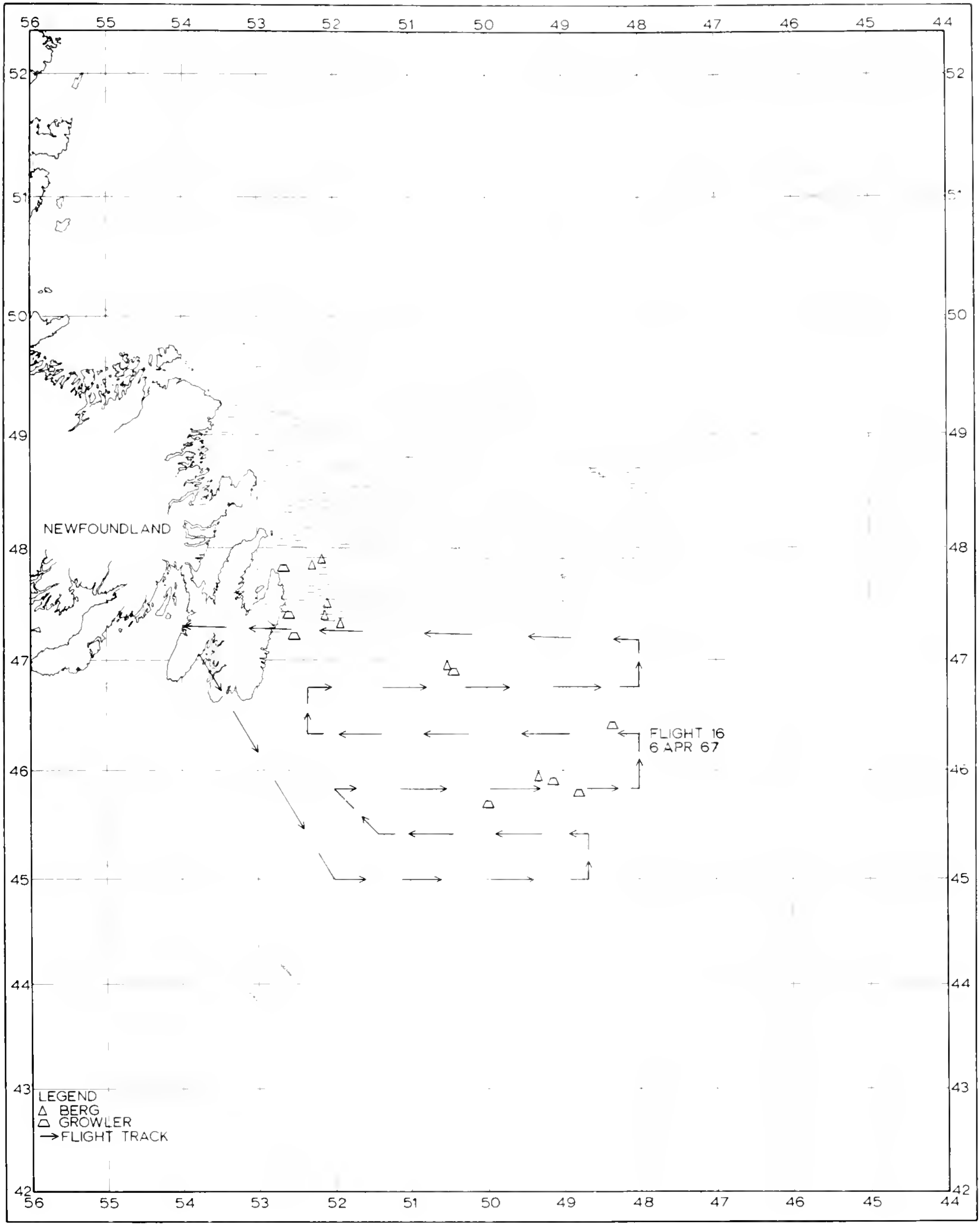


Figure 8.—Ice Conditions, 6 and 7 April 1967.

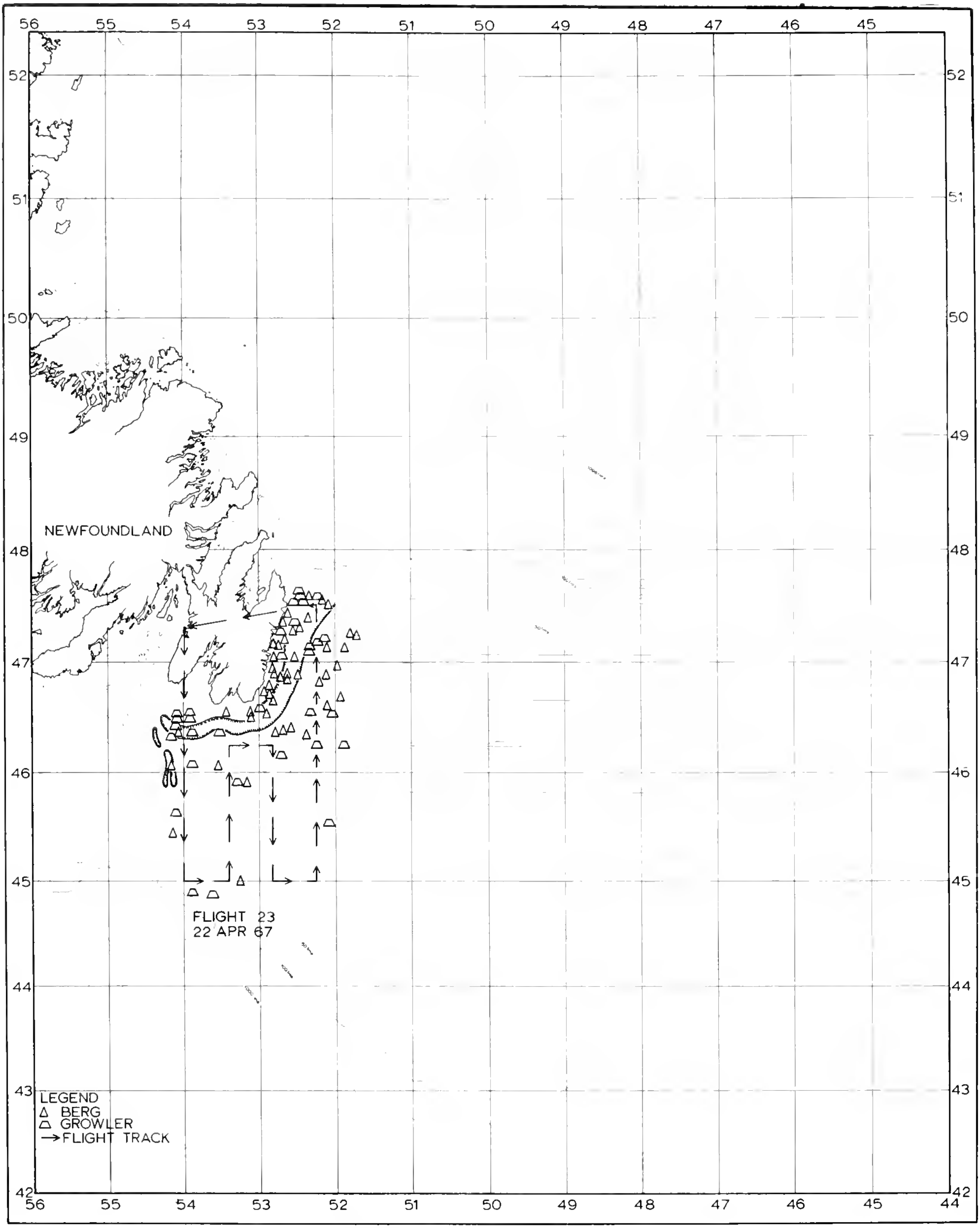


Figure 9.—**Ice Conditions, 23 and 24 April 1967.**

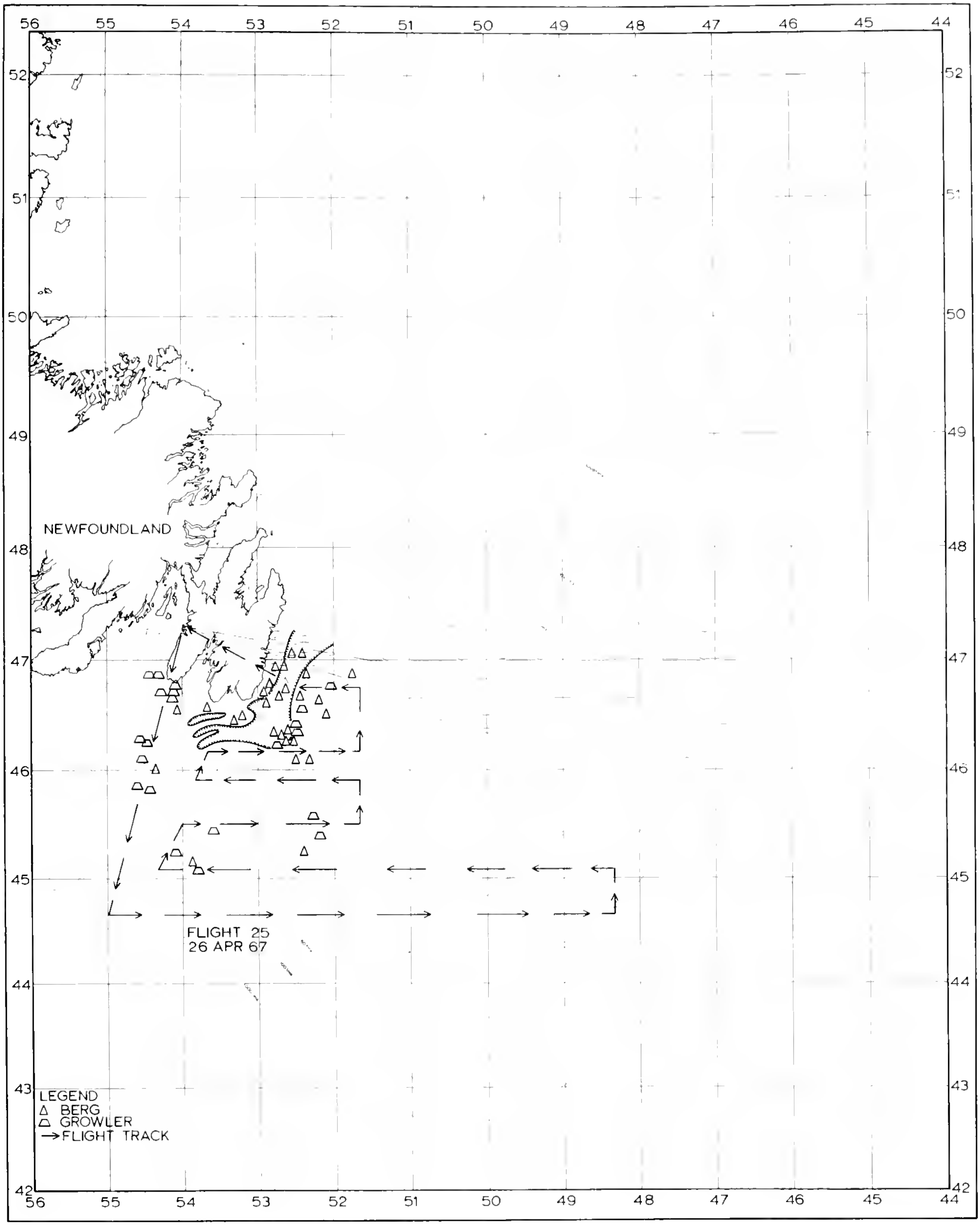


Figure 10.—Ice Conditions, 25 and 26 April 1967.

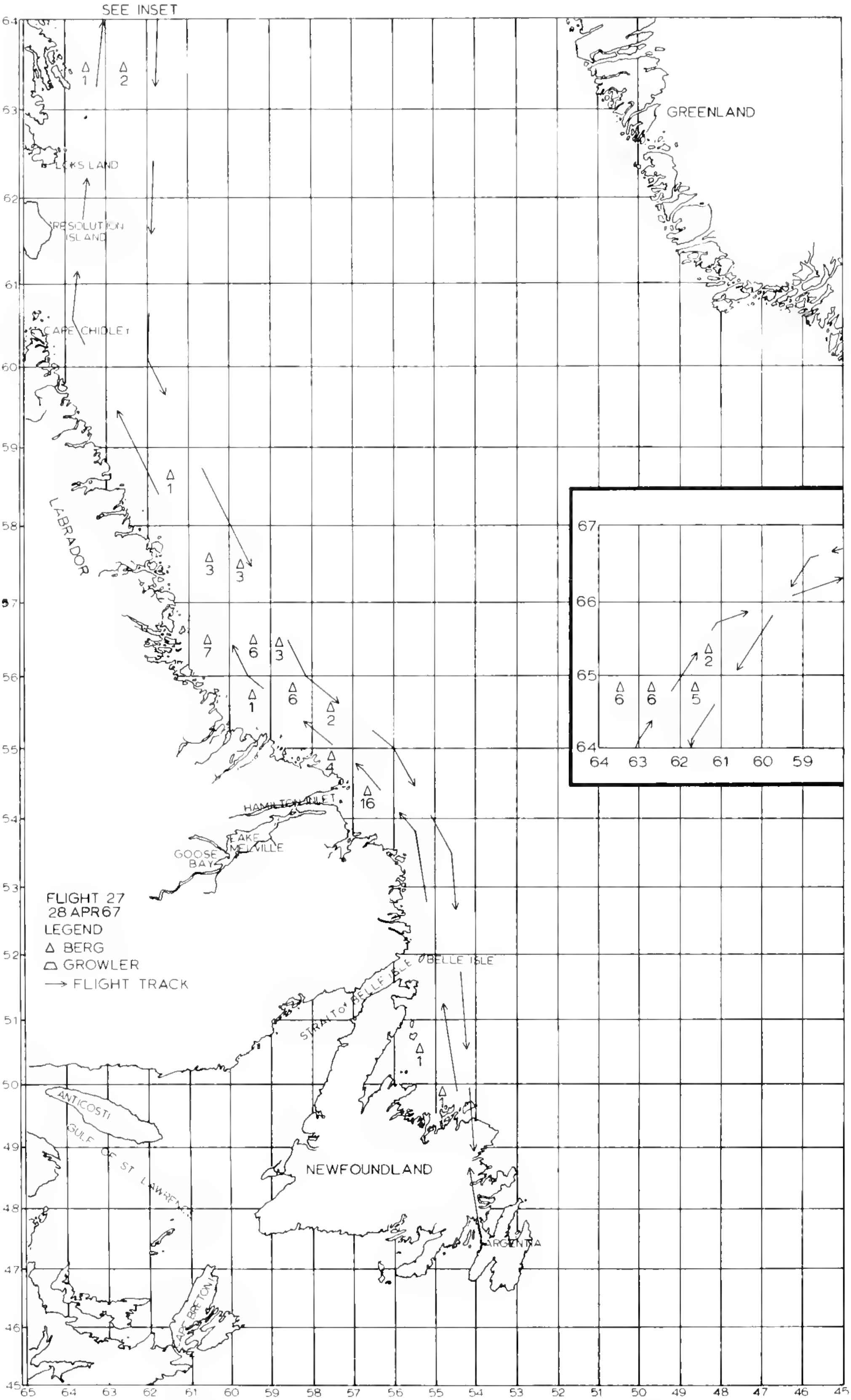


Figure 11.—Ice Conditions—Strait of Belle Isle to Cape Dyer, 28 April 1967.

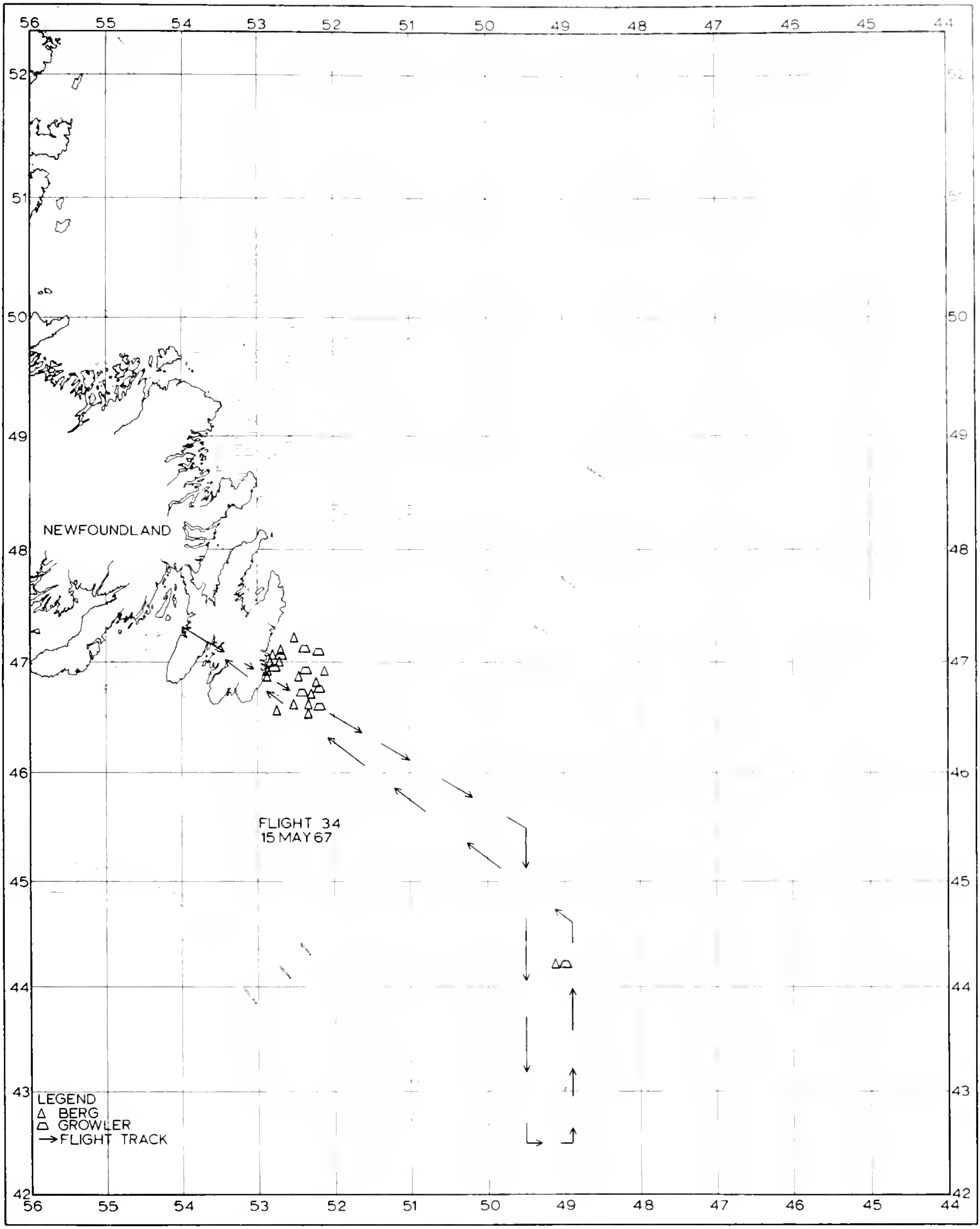


Figure 12.—Ice Conditions, 15 May 1967.

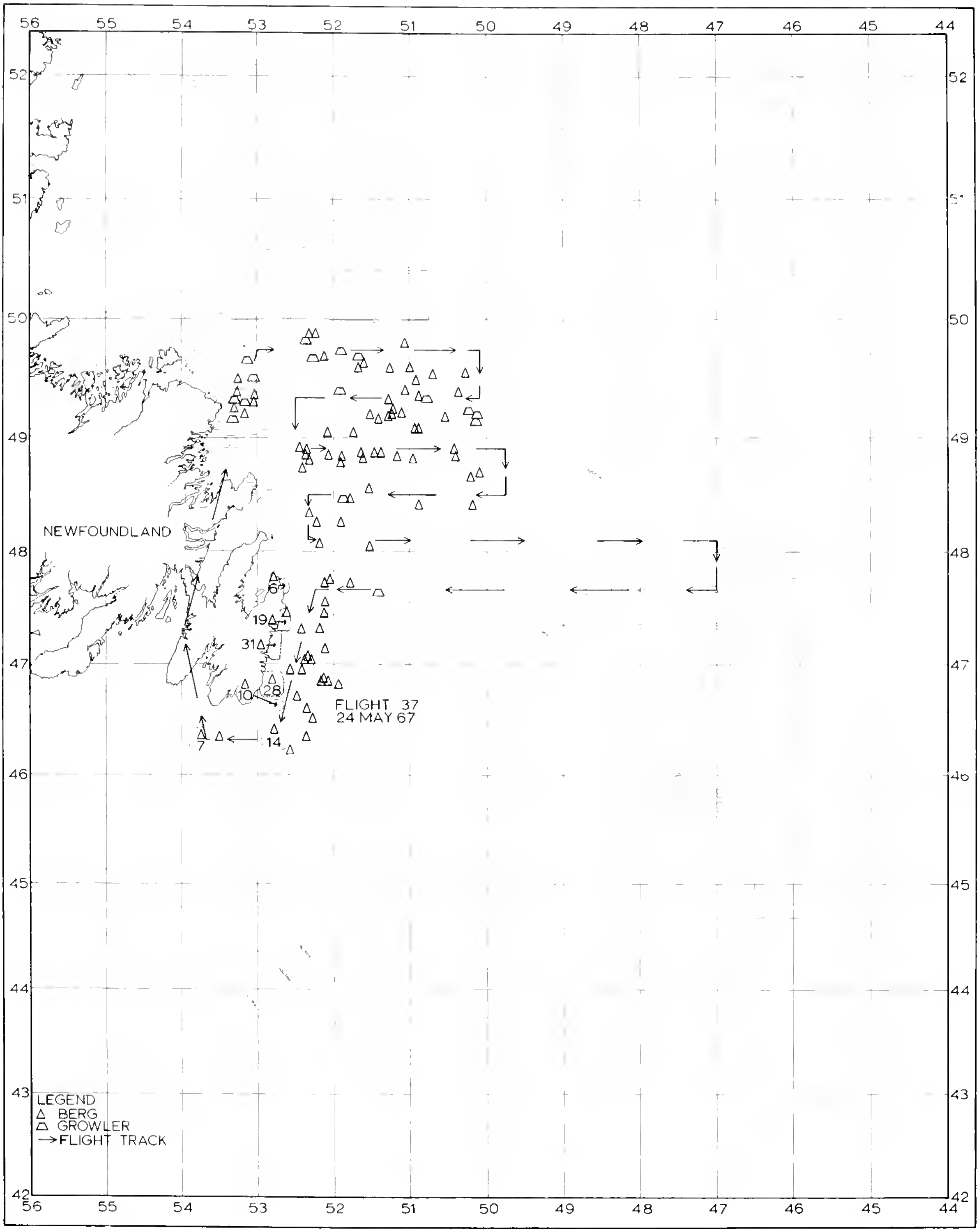


Figure 13.—Ice Conditions, 24–26 May 1967.

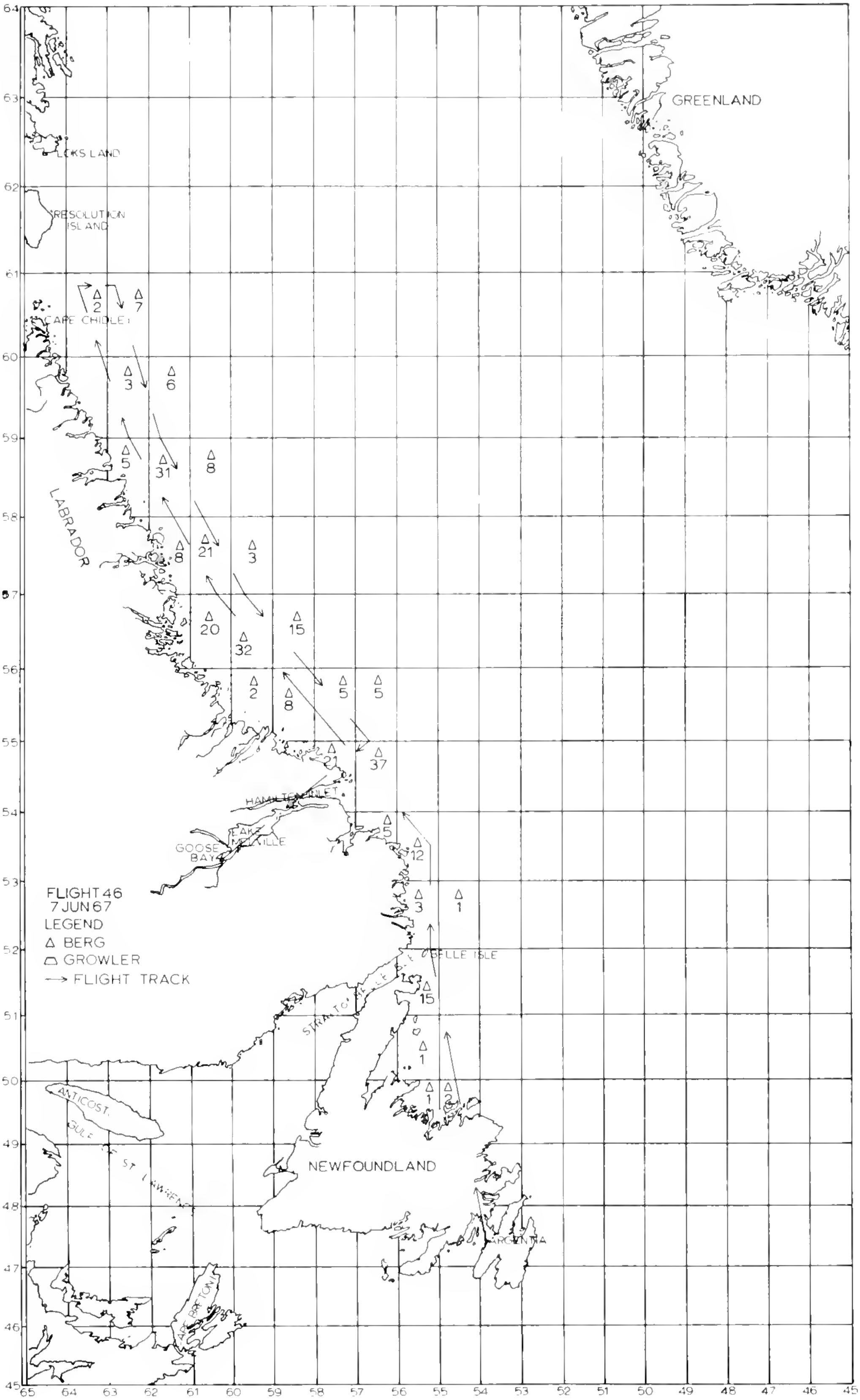


Figure 14.—**Ice Conditions, 7 June 1967.**

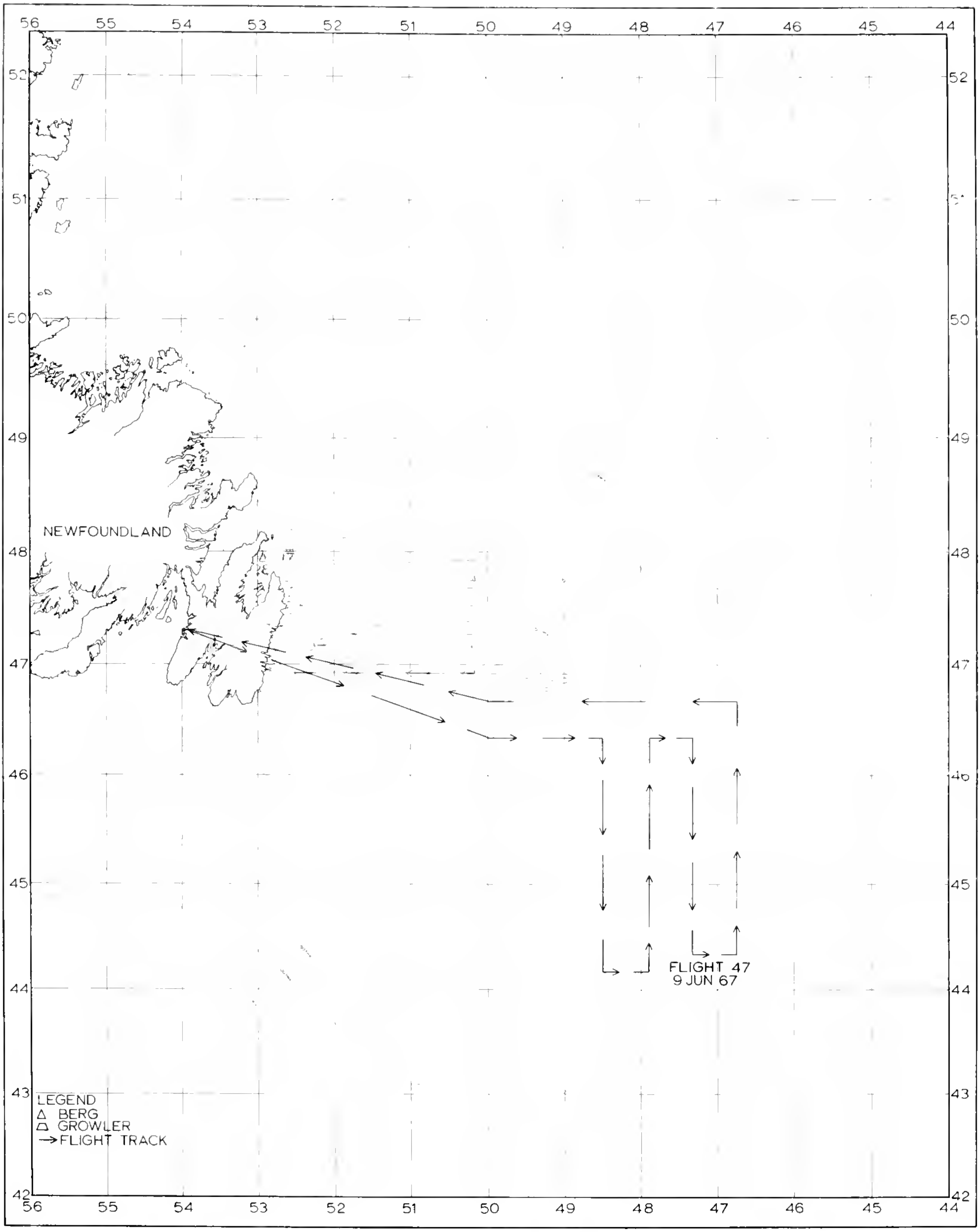


Figure 15.—Ice Conditions, 9–12 June 1967.

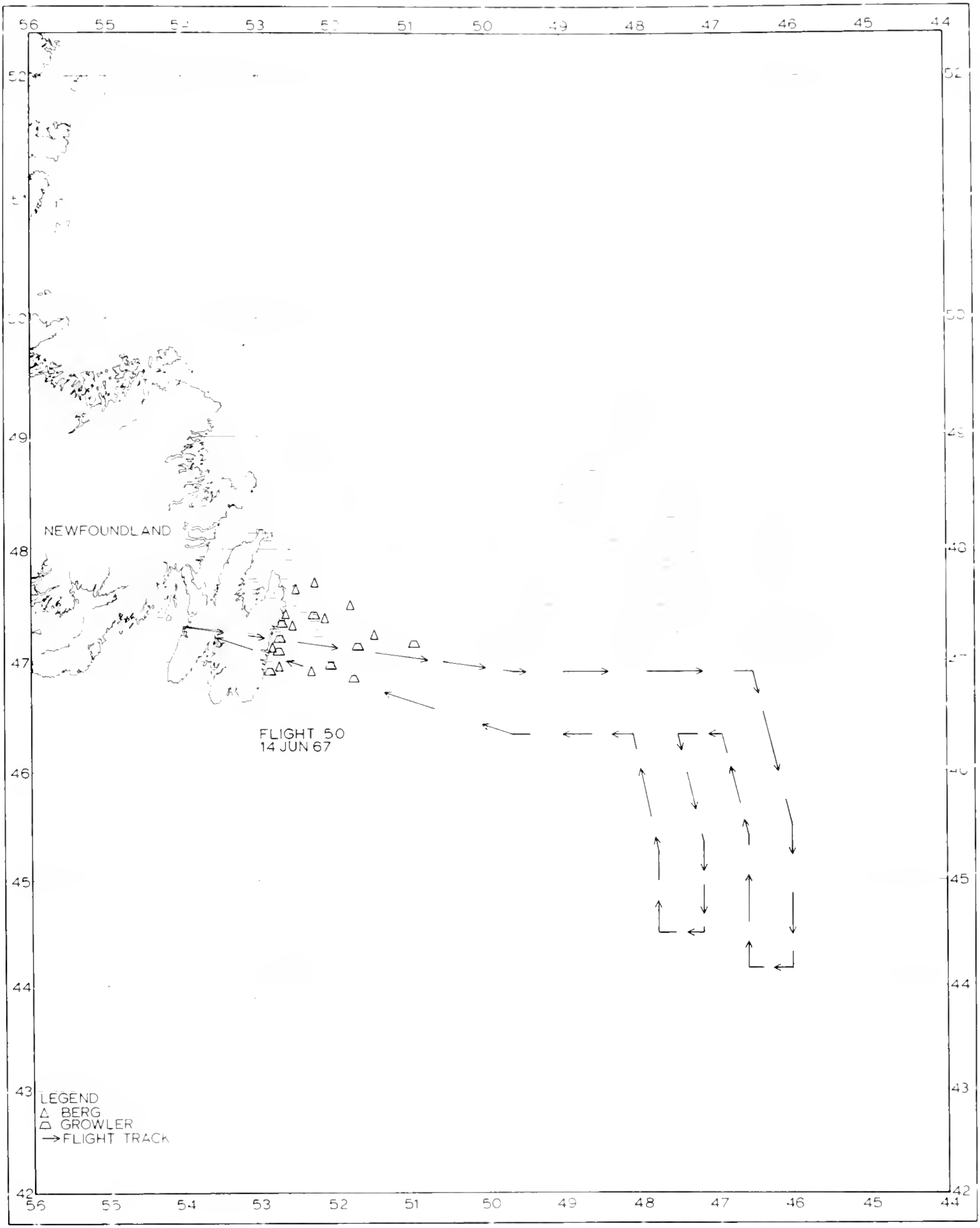


Figure 16.—Ice Conditions, 14–20 June 1967.

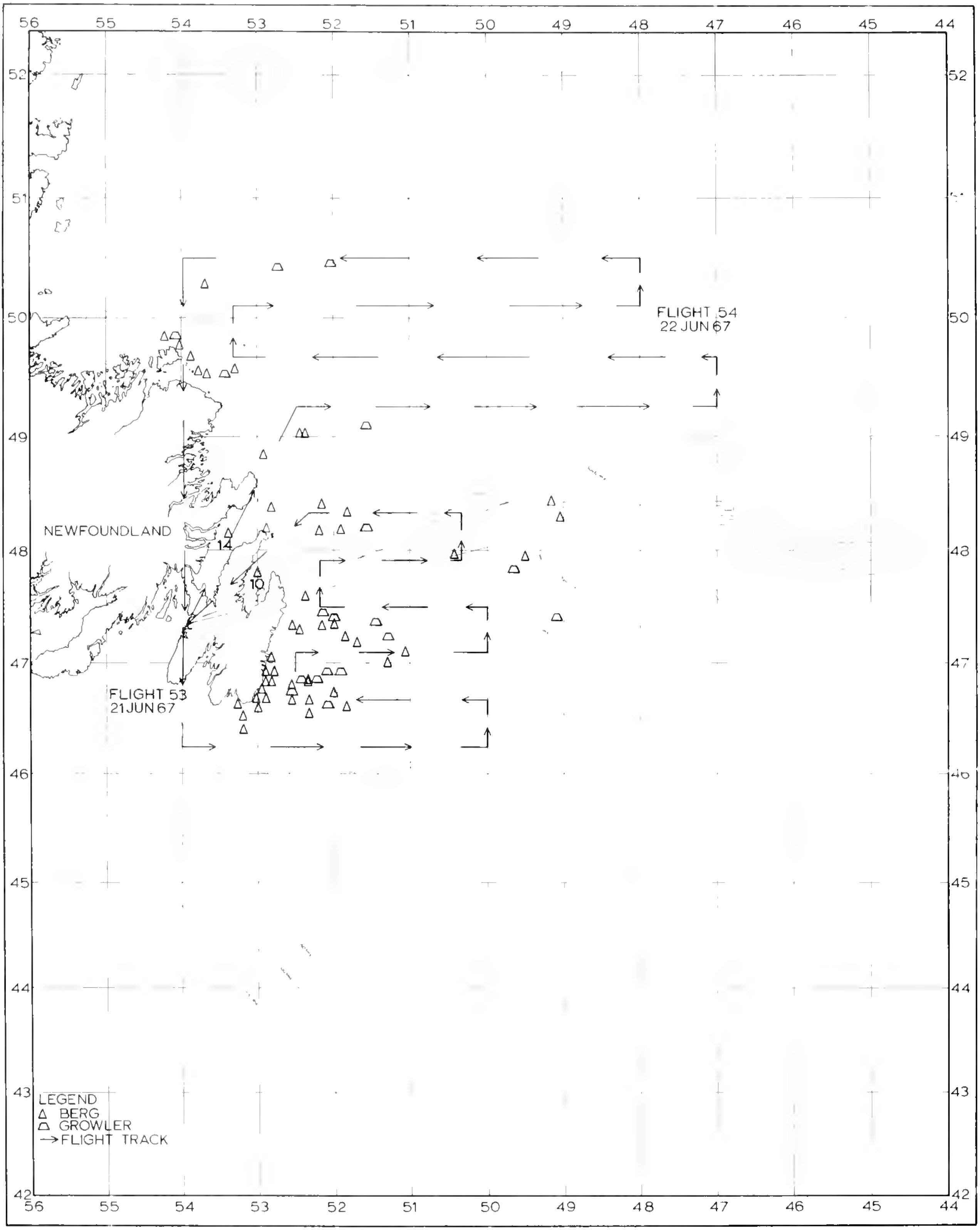


Figure 17.—Ice Conditions, 21–27 June 1967.

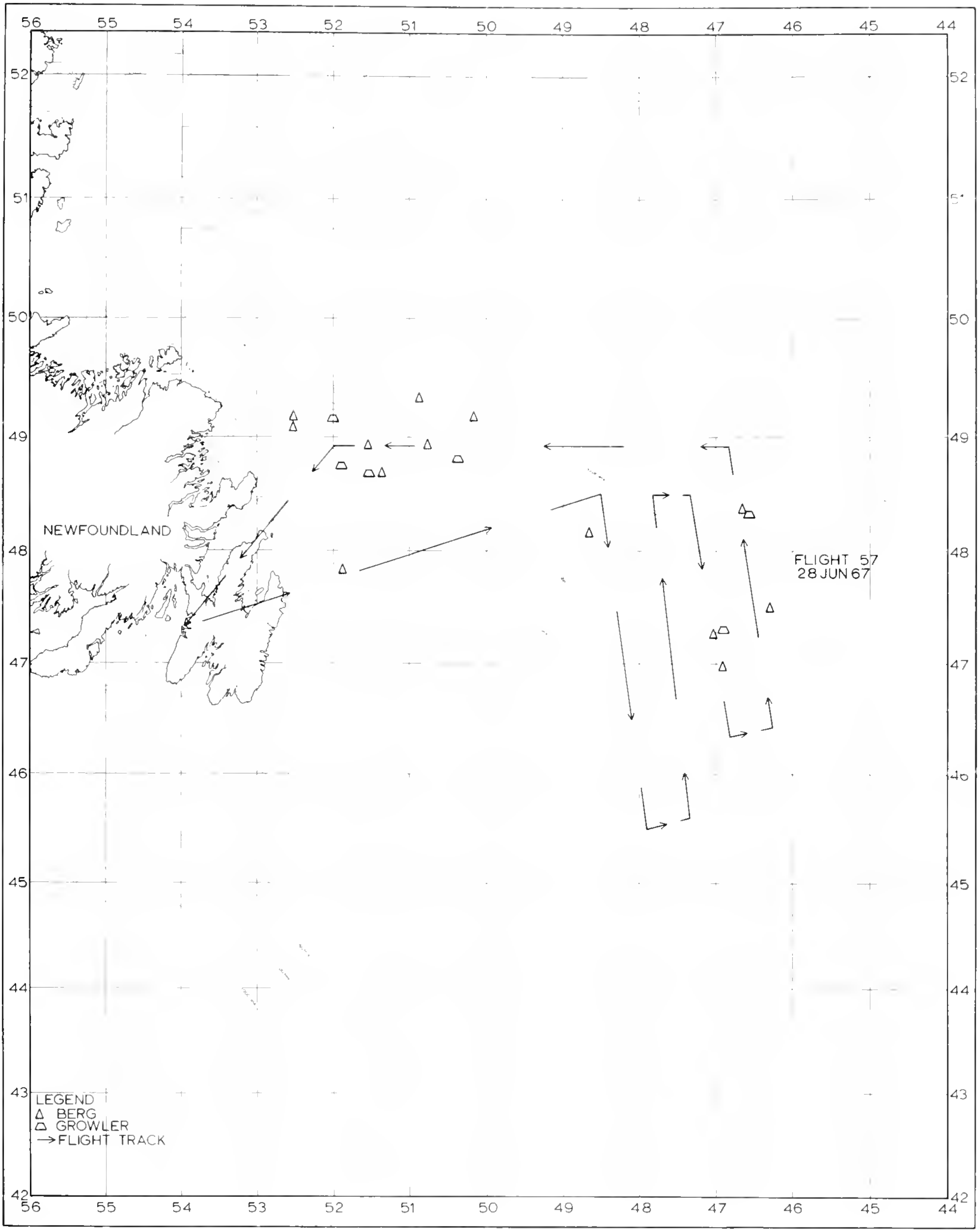


Figure 18.—Ice Conditions, 28 June–1 July 1967.

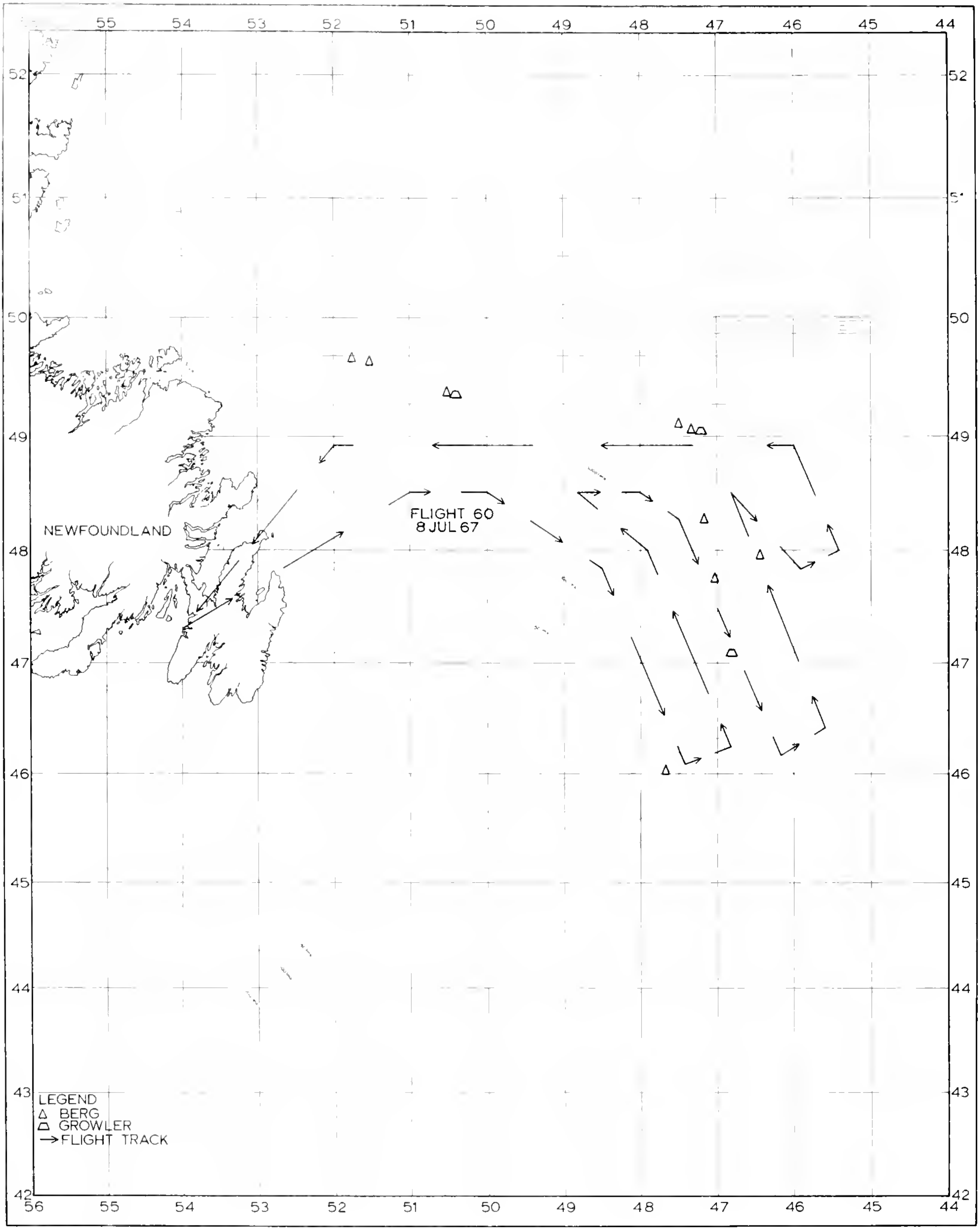


Figure 19.—Ice Conditions, 8–12 July 1967.

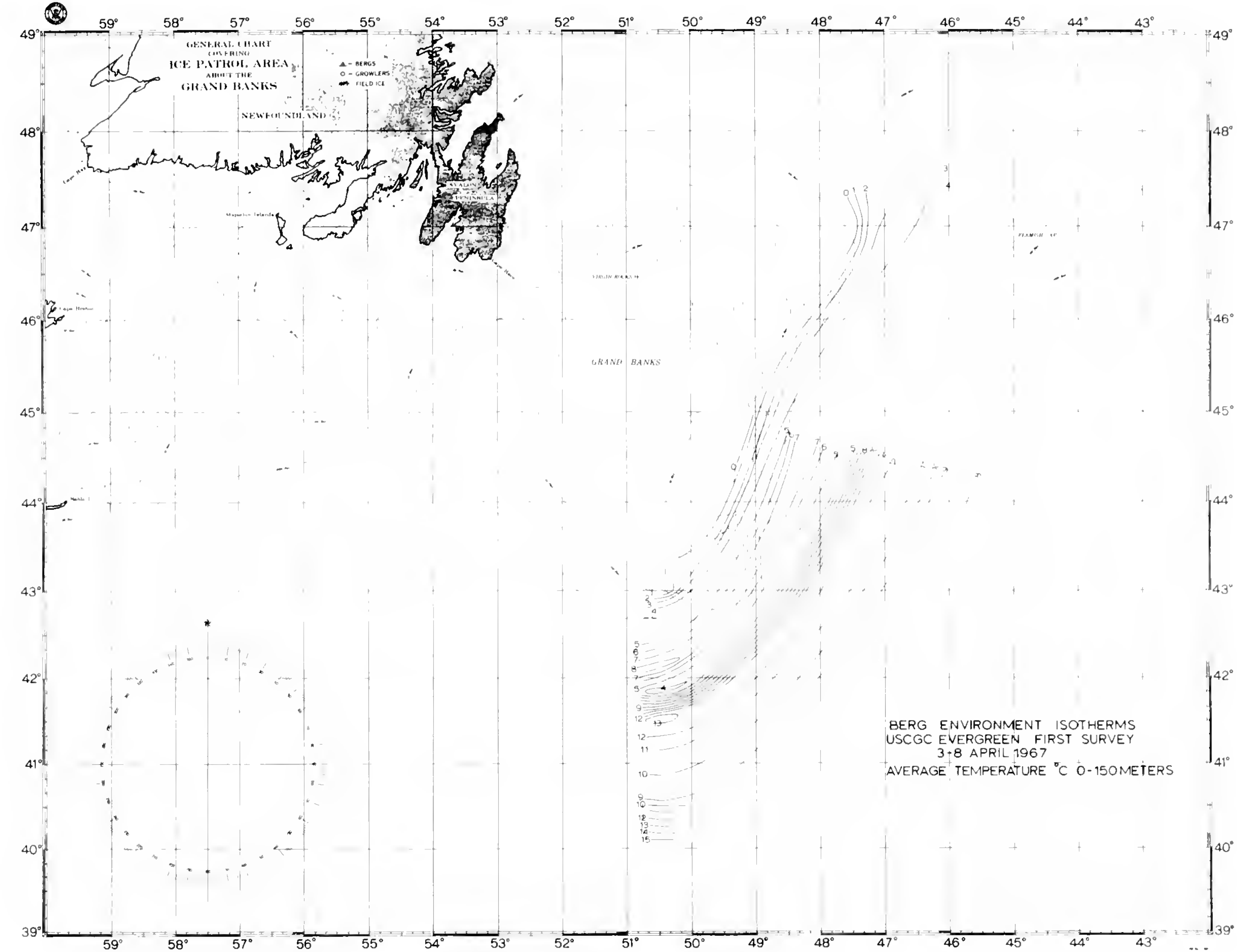


Figure 20—Isotherms of Average Sea Temperatures, 0–150 meters, 3–8 April 1967.

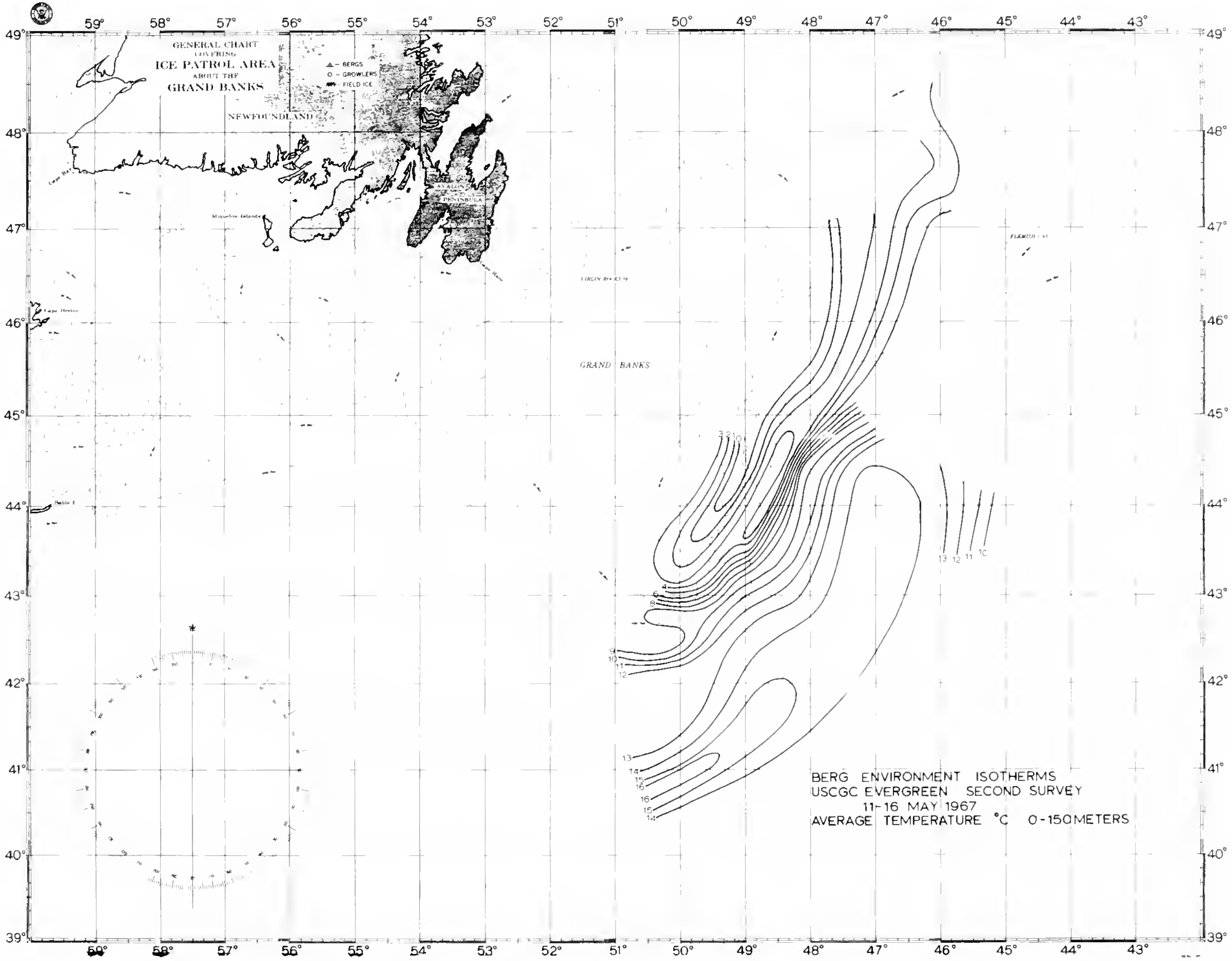


Figure 21.—Isotherms of Average Sea Temperatures, 0–150 meters, 11–16 May 1967.

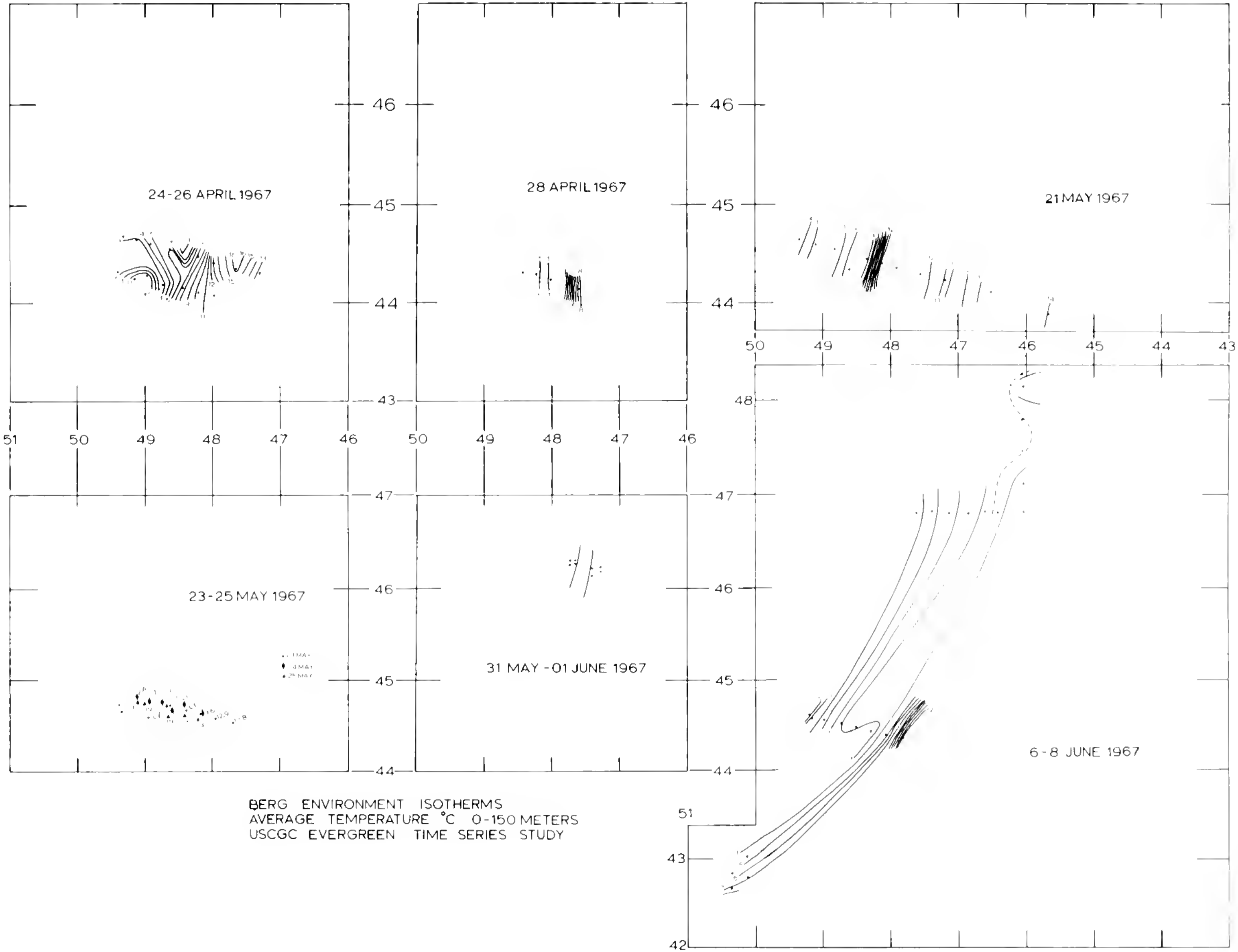


Figure 22.—Isotherms of Average Sea Temperatures, 0-150 meters, Time Series Studies.

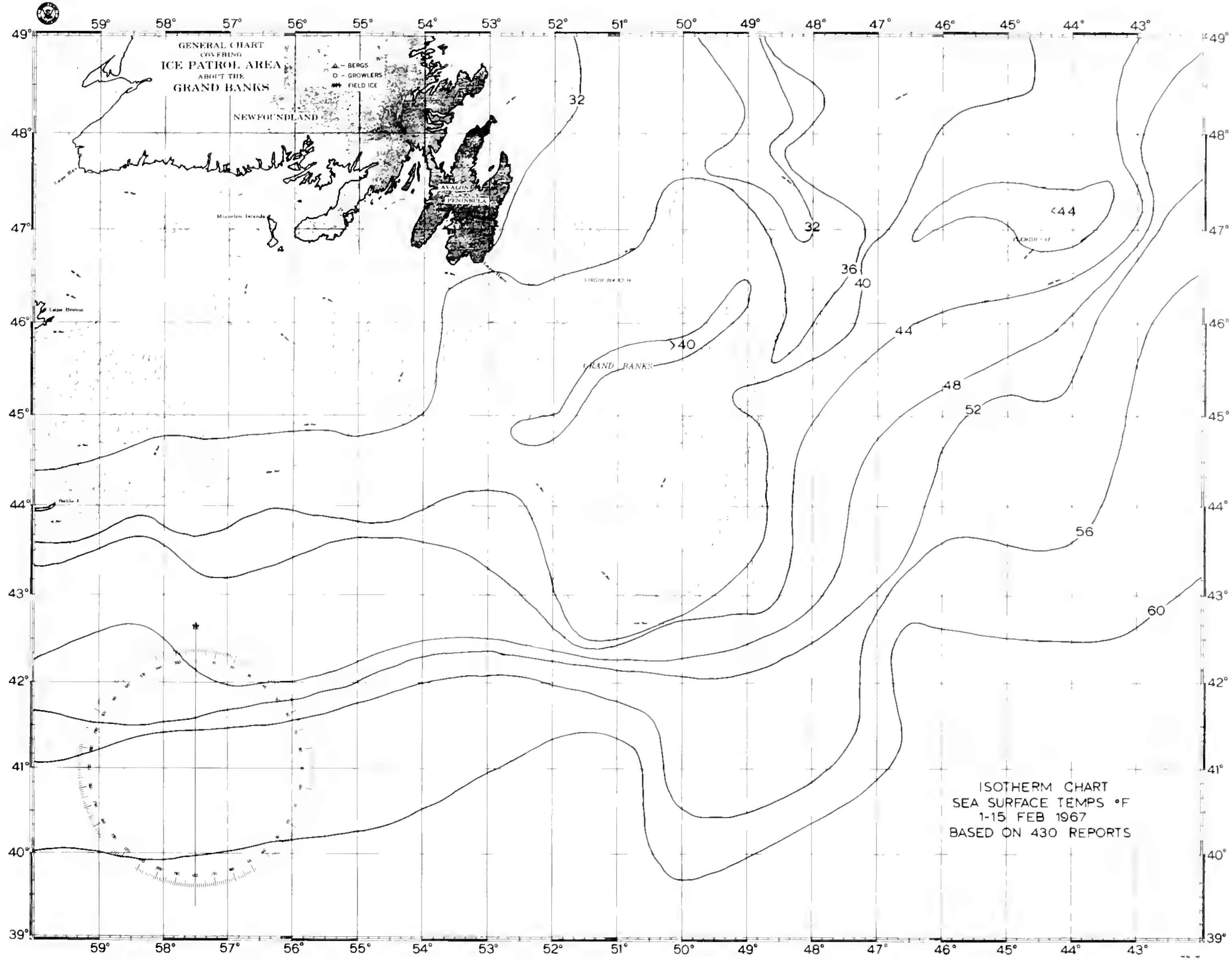


Figure 23.—Sea Surface Isotherms, 1–15 February 1967.

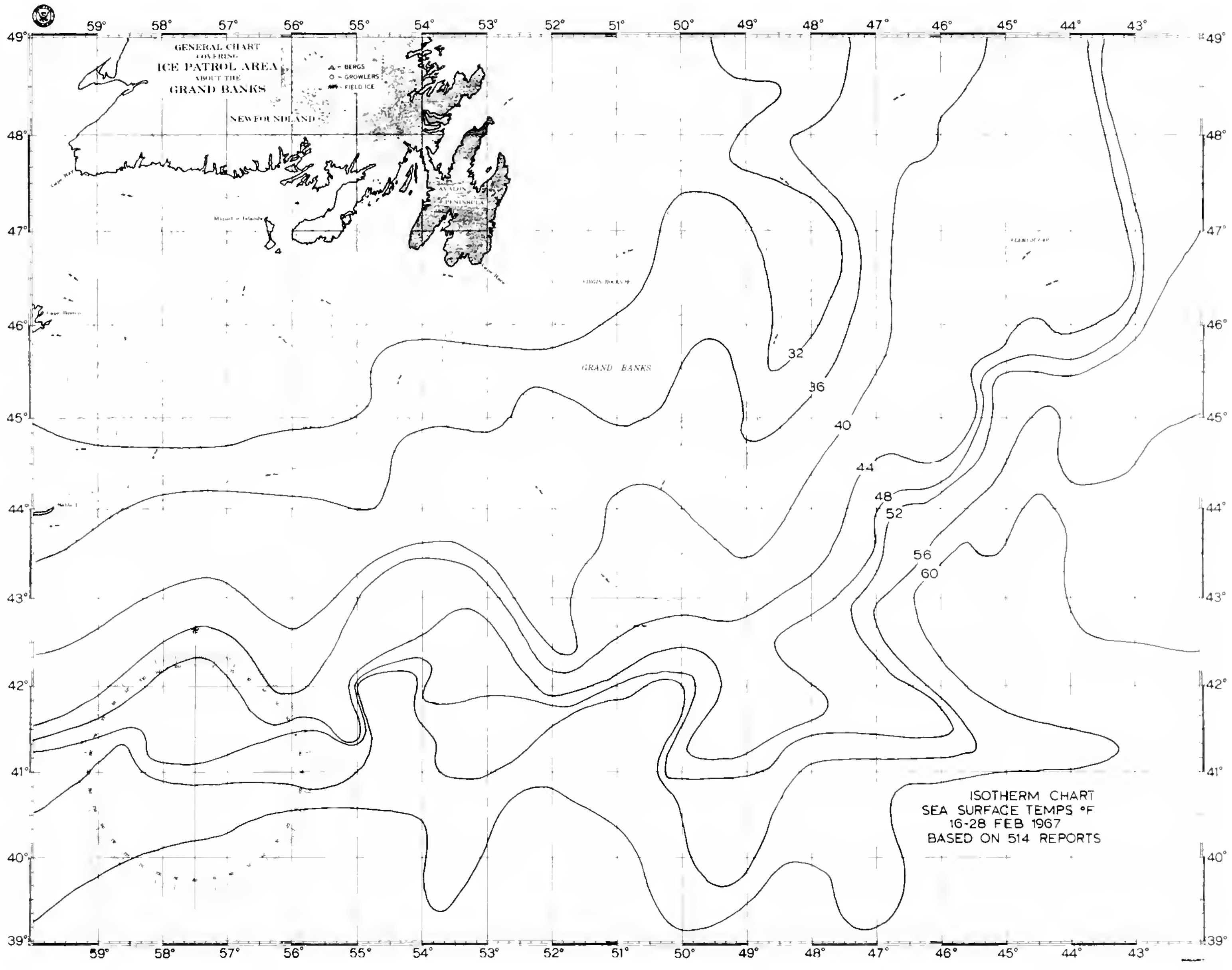


Figure 24.—Sea Surface Isotherms, 16–28 February 1967.

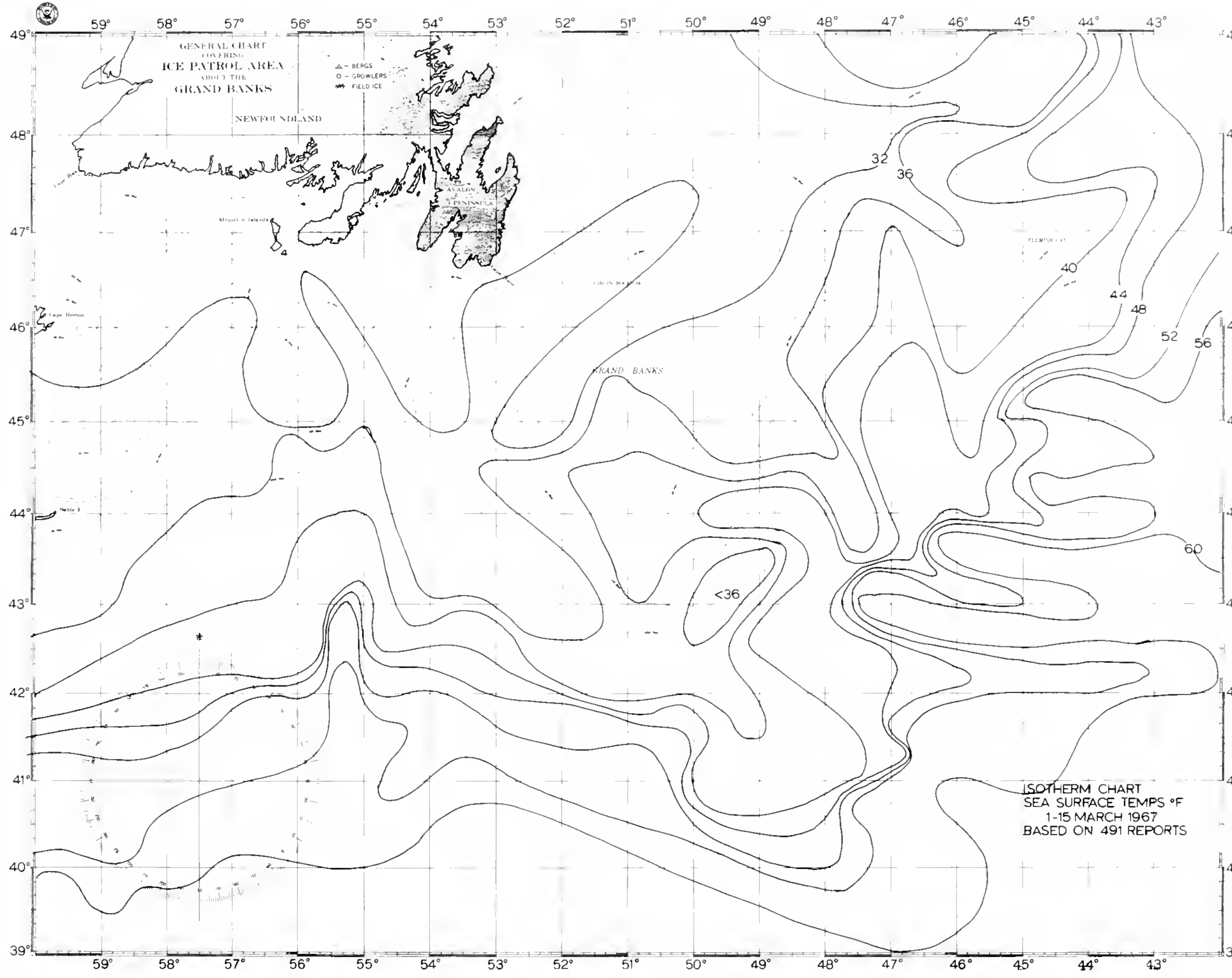


Figure 25.—**Sea Surface Isotherms, 1–15 March 1967.**

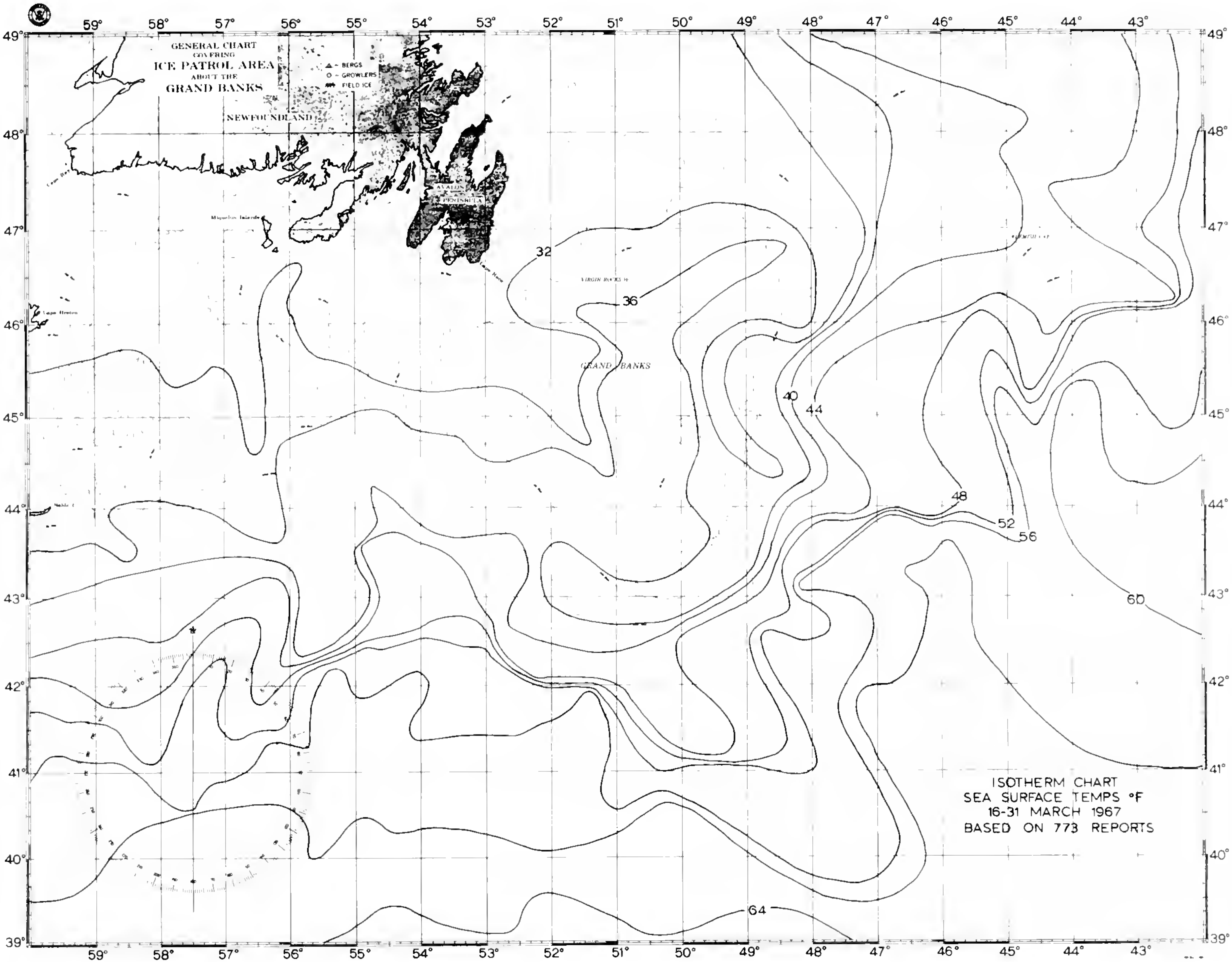


Figure 26.—Sea Surface Isotherms, 16–31 March 1967.

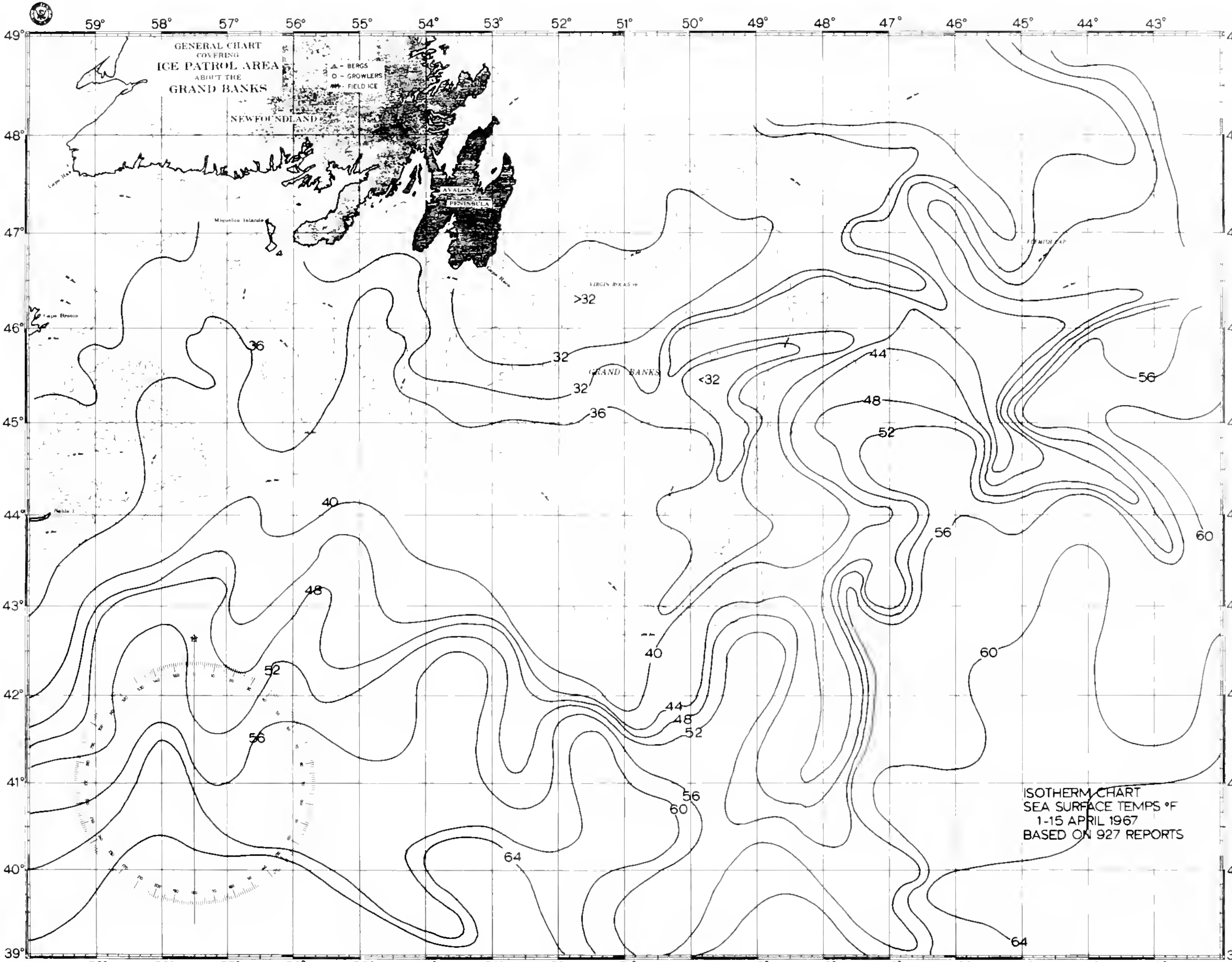


Figure 27.—Sea Surface Isotherms, 1–15, April 1967.

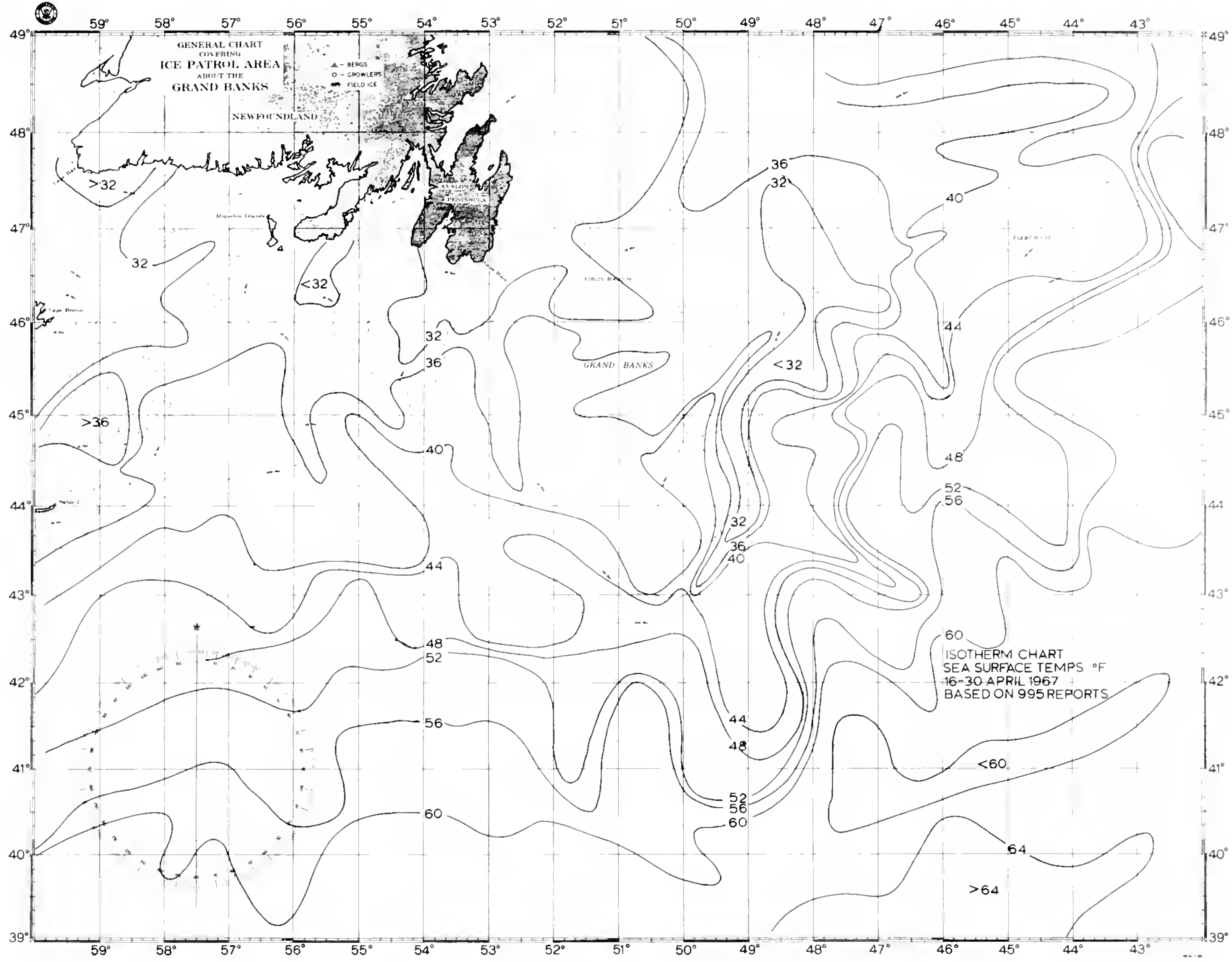


Figure 28.—Sea Surface Isotherms, 16–30 April 1967.

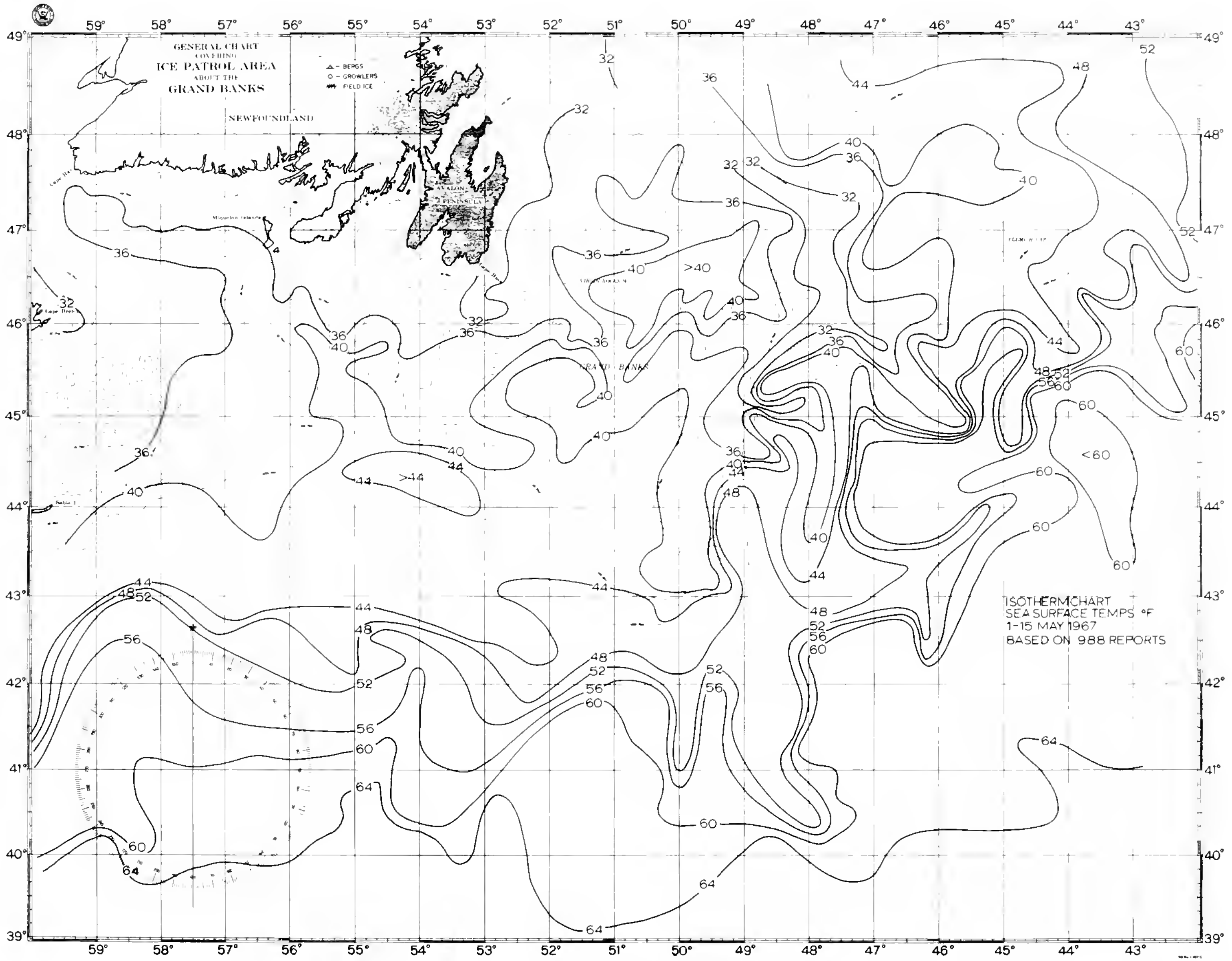


Figure 29.—Sea Surface Isotherms, 1–15 May 1967.

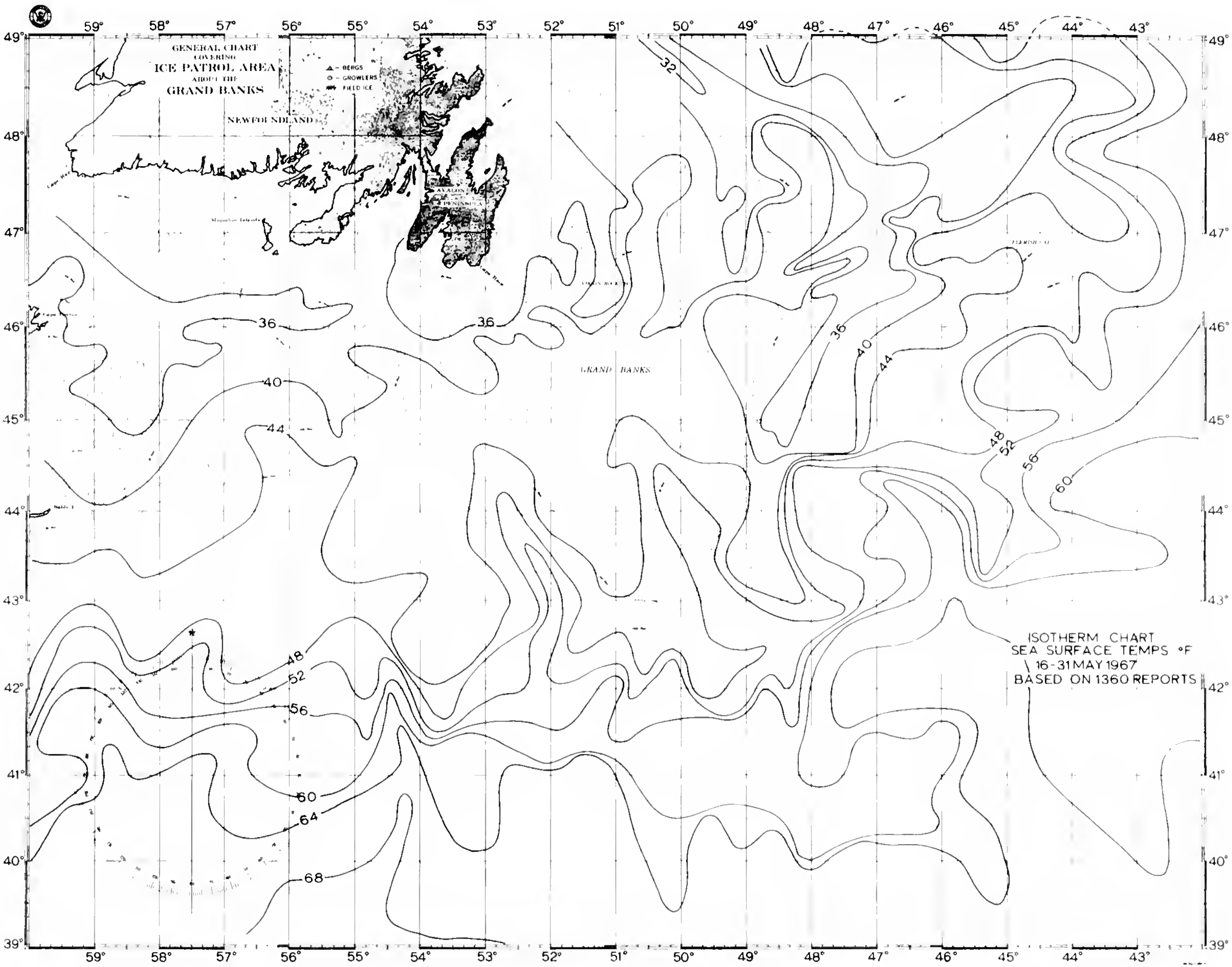


Figure 30.—Sea Surface Isotherms, 16–31 May 1967.

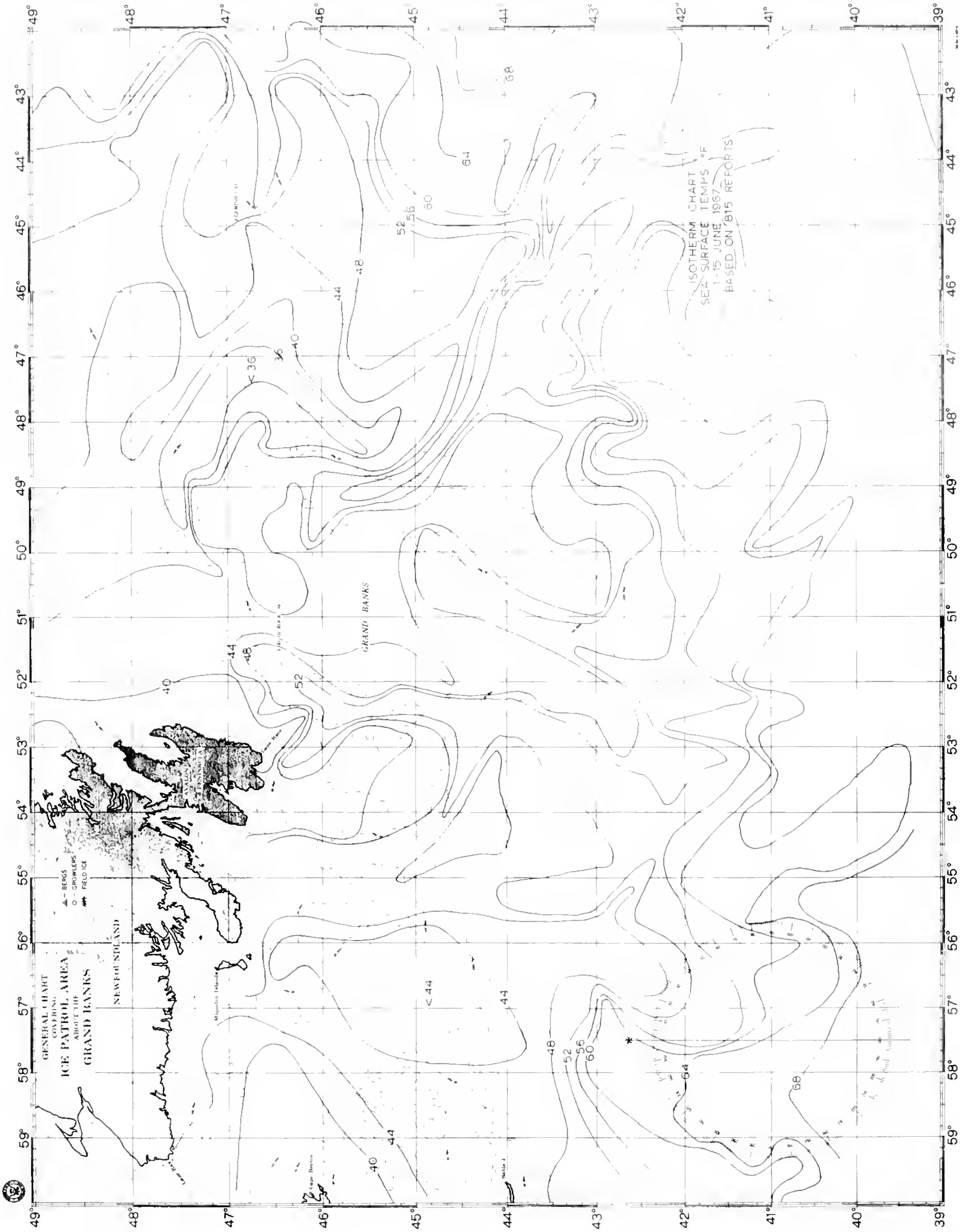
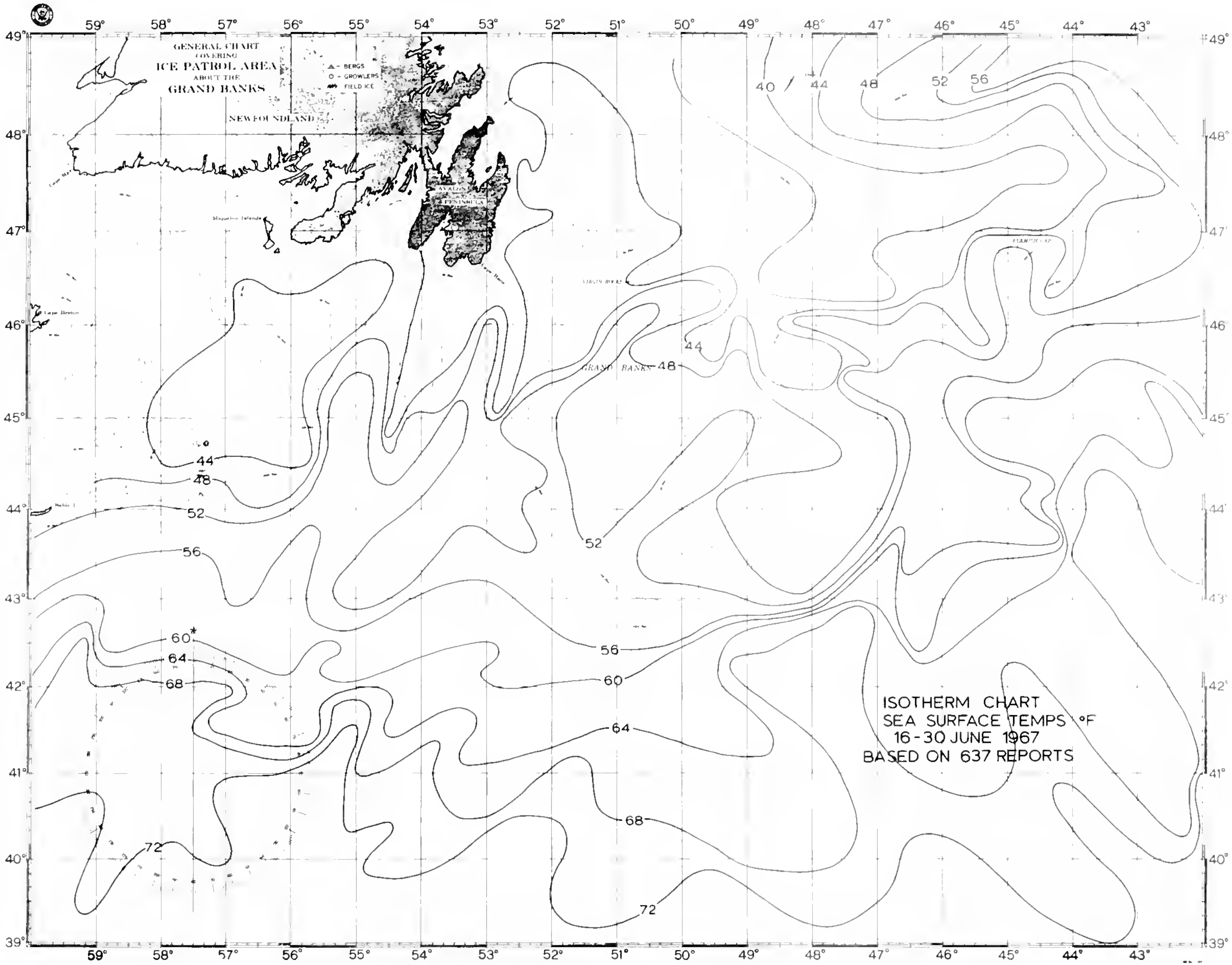


Figure 31.—**Sea Surface Isotherms, 1–15 June 1967.**



Fiugre 32.—Sea Surface Isotherms, 16–30 June 1967.

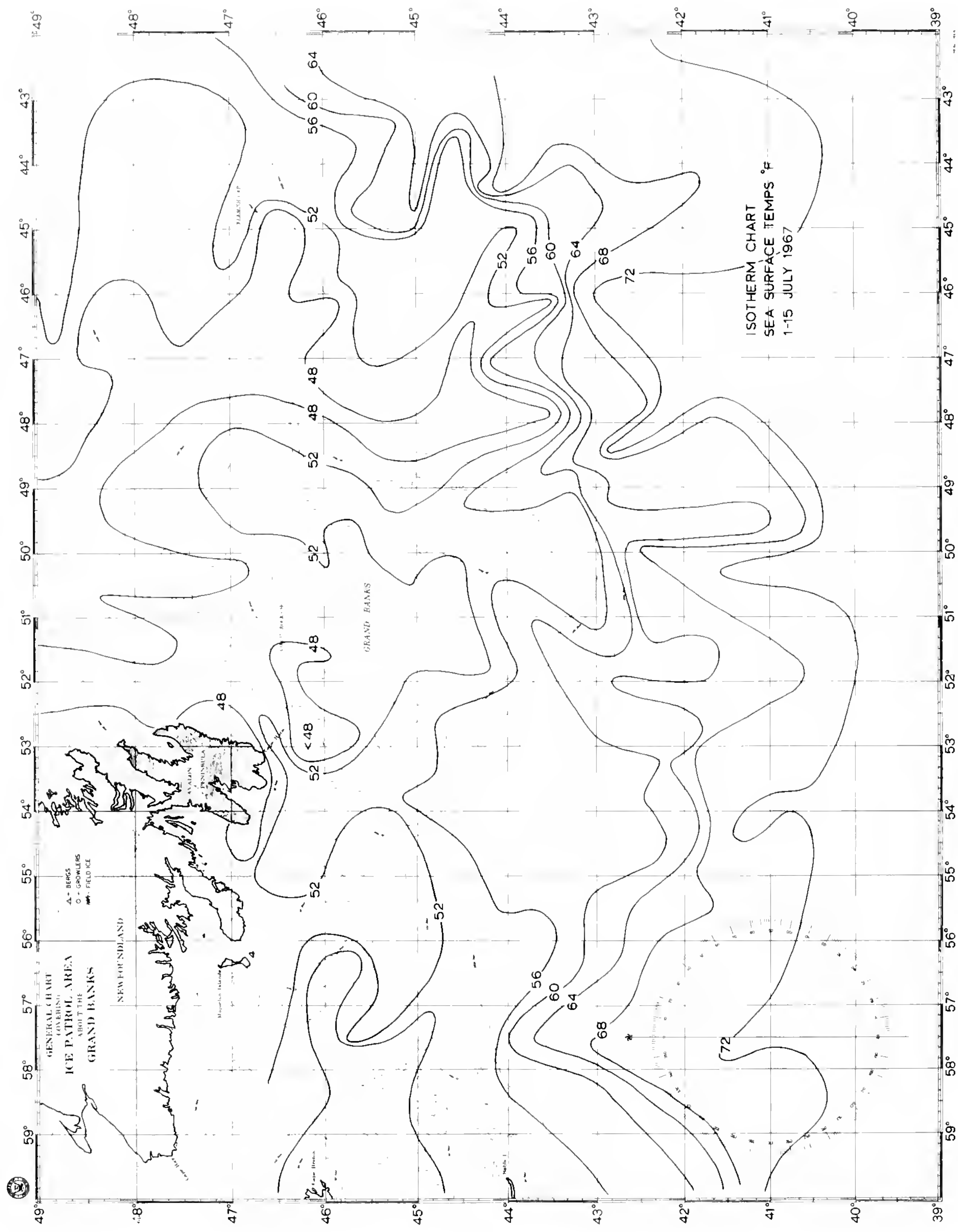


Figure 33.—Sea Surface Isotherms, 1–15 July 1967.

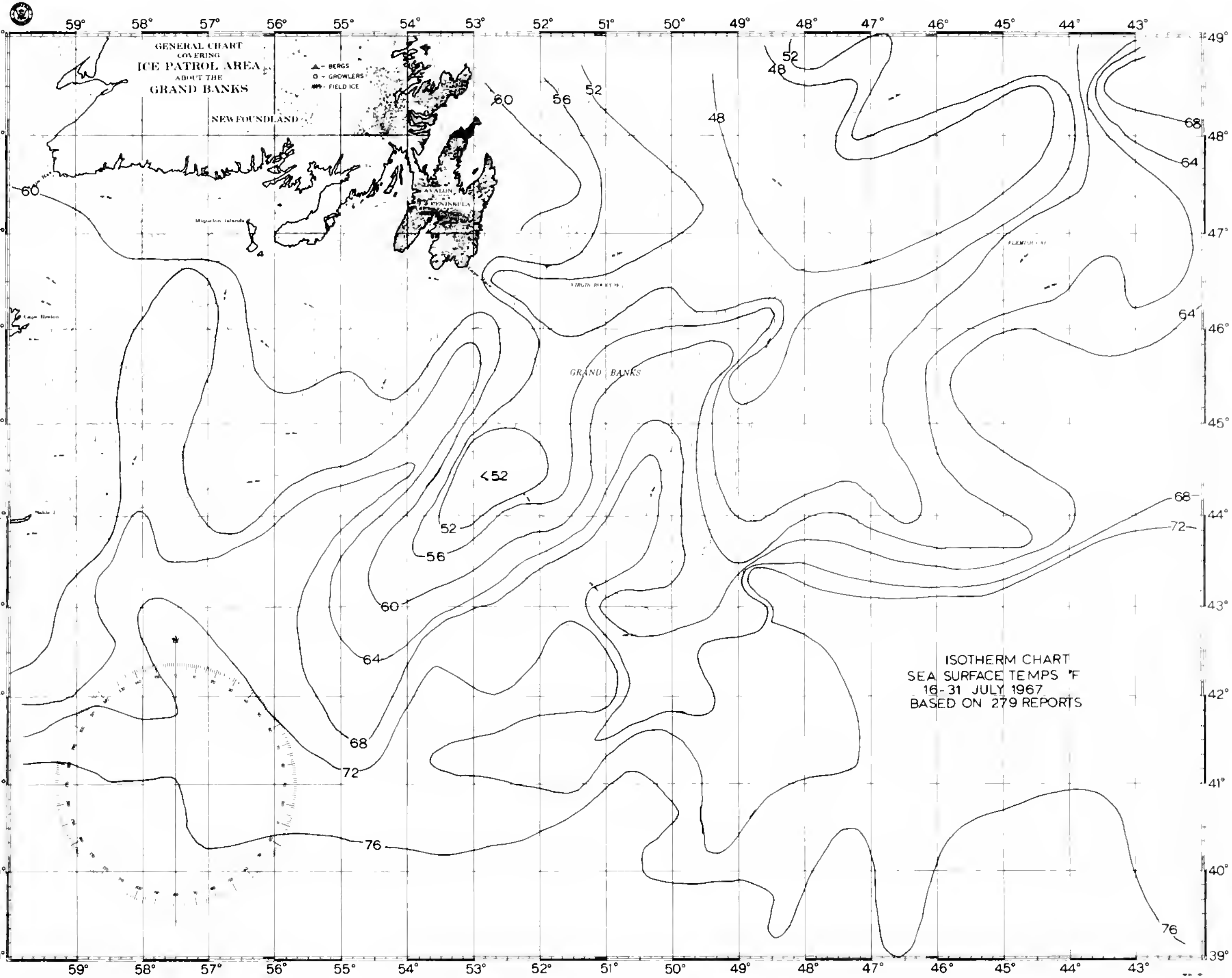


Figure 34.—**Sea Surface Isotherms, 16–31 July 1967.**

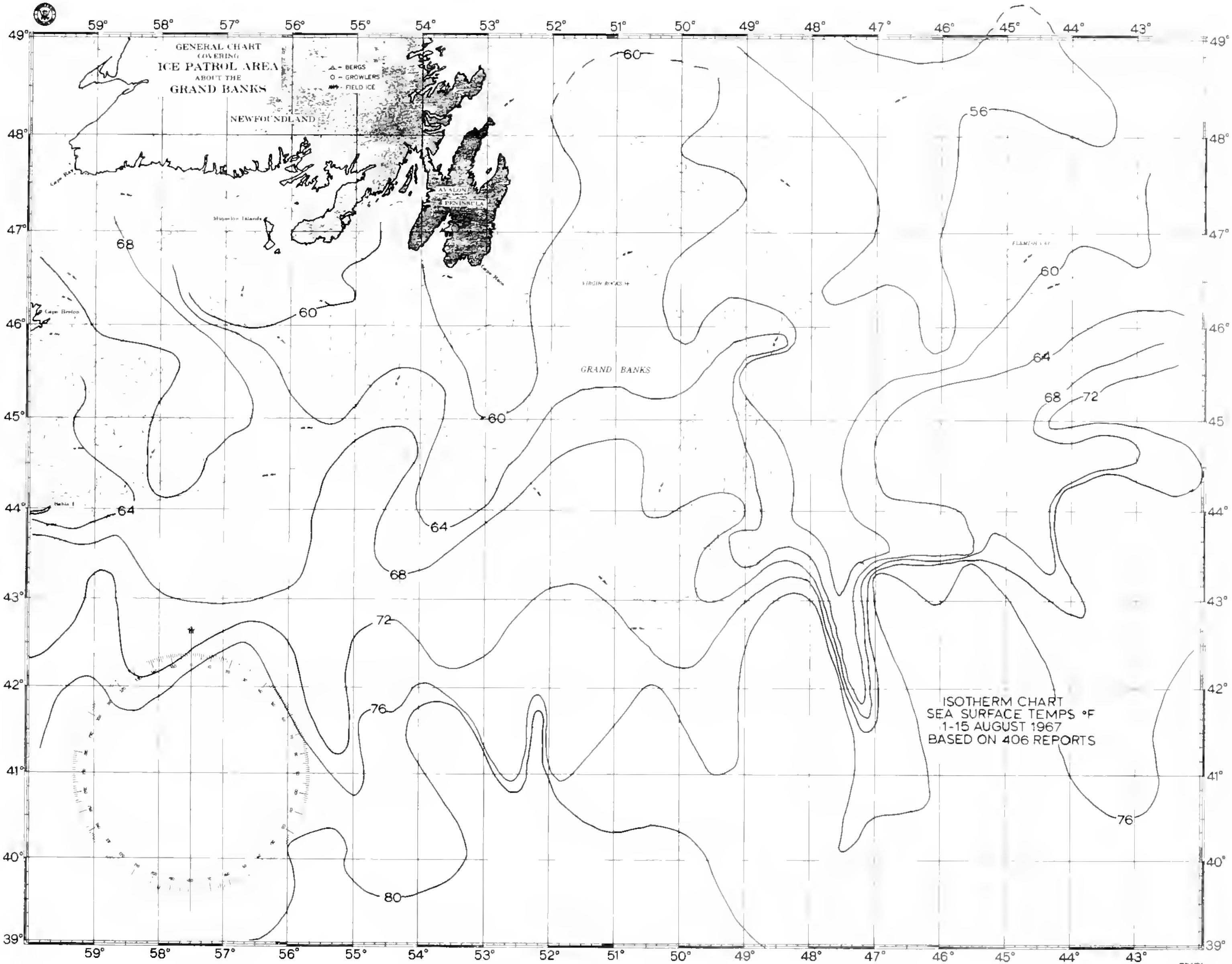


Figure 35.—Sea Surface Isotherms, 1–15 August 1967.

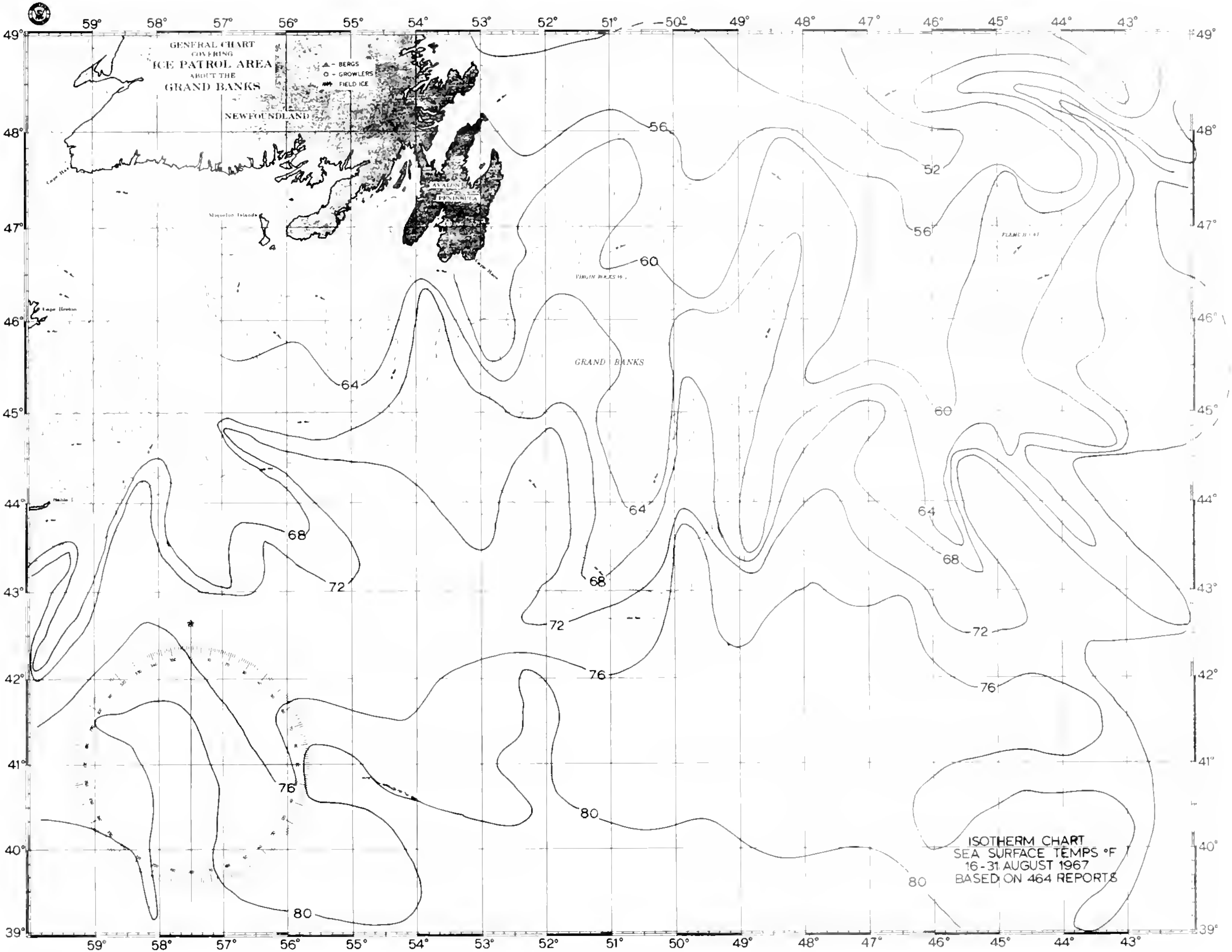


Figure 36.—Sea Surface Isotherms, 16–31 August 1967.

ICE AND WEATHER REPORTS

(By country)

Vessel	Weather Reports	Ice Reports
ARGENTINA		
LSQU	1	
BELGIUM		
SS Congo Moko	3	
SS Eeklo		1
SS Frubel Europa	5	
SS Marley 2		1
SS Mantalto	14	
SS Mol	26	
SS Tielrode	23	2
SS Kamina	1	
CANADA		
SS Chaudirer	4	3
DENMARK		
SS Helga Dan	18	
SS Minnesota		1
SS Missouri	1	1
SS Rimja Dan	2	1
SS Tuborg	5	
FINLAND		
SS Degero	3	
SS White Rose	11	
SS Hansa		1
SS Gregerso		1
FRANCE		
SS Commandant Bourdais	54	38
SS Pengall	5	
SS Stigmaria	15	
SS Penchateau	3	4
SS Thalassa	2	
SS Washington	1	
SS Le Moyne Diberville	40	5
SS Guyane	6	
SS Carbet	6	1
SS Carimare	1	
SS Winnipeg	1	1
SS France	3	
SS Cetra Columbia	1	2
SS Ampere		1
SS Jean L. D.	8	2
GERMANY		
SS Volumnia	1	3
GERMANY—Cont.		
SS Herman Russ		1
SS Transamerica	7	1
SS Esso Nurnberg	9	
SS Elizabeth Schulte	9	
SS Konsul Schulte	20	
SS Johannes Fritzen		1
SS Berkershiem	1	
SS Luetjenburg	5	
SS Susanne Fritzen	11	1
SS Rheinstein	1	1
SS Susanne	1	
SS Bieberstein	3	
SS Undine	1	1
SS Erich Schroeder	3	1
SS Transmichigan	1	
SS Weissenberg	16	2
SS Cap Verde	3	
SS Hilde Mittman	10	
SS Magdaburg	11	4
SS Poseidon	2	3
SS Ferd Freiligrath	12	
SS Rudgert Vinnen	7	3
SS Elsa Essberger	8	
SS Transatlantic	2	
SS Leada		1
SS Hildagard Doerenk	3	2
SS Uranus	14	1
SS Esso Dusseldorf	2	
SS Magdalena Oldendorf	6	3
SS Chris Oldendorf	27	
SS Elsfleth	1	
SS Flensburg	2	3
SS Wolfsburg	2	
SS Johann C. Schulte		1
SS Brunskappel	9	
SS Marie L. Bolten		1
GREECE		
SS Georgigs Ntanes	9	
SS Chloe		1
SS Queen Fredricka	2	1
SS Monica S.		1
SS Atrotos	10	1
SS Venus	1	
SS Argo Navis	1	
SS Queen Anna Maria	8	
SS Irena		1
SS Martha	1	

Vessel	Weather Reports	Ice Reports
ICELAND		
SS Bruarfoss		1
INDIA		
SS Jaladharati	8	...
SS Chennai Ookkam	3	2
SS Jalajyoti	6	....
SS Jalaratna	4	.
IRELAND		
SS Irish Rose	4	1
SS Irish Willow	12	.
SS Irish Sycamore	1	1
SS Irish Plane		4
ISRAEL		
SS Azgad 3	7	6
SS Timna	5	. . .
ITALY		
SS Guido Donegani		1
SS Raffaello	6	
SS Cristaforo Columbo	11	
SS Leonardo Da Vinci	1	
SS Golfo Di Palermo	4	1
SS Golfo Di Palermo	4	1
SS Auctoritas	1	2
SS Polinnia	6	1
SS Michaelangelo	8	
JAPAN		
SS Akita Maru	11	
SS Gloria Maru	13	
LIBERIA		
SS Ore Transport	5	
SS Gold Star	24	....
SS Invicta		1
SS White River		2
SS Doriefs	15	....
SS World Seafarer	2	2
SS San Juan Traveler	4	. . .
SS Tees Ore	8	
SS Cynthia		1
SS Cypruss	14	1
SS Lakmos	2	....
SS Alkaid	1	2
NIGERIA		
SS Nnamdi Azikiwe	2	
NETHERLANDS		
SS Ampenan	1	1
SS Bawean		1
SS Dordrecht	2	2
SS Gaasterdyk	5	1
SS Gorredyk		1
SS Grebbedyk	14	1
NETHERLANDS—Cont.		
SS Grotedyk		1
SS Gulf Italian	1	1
SS Kerkedyk	1	.
SS Kinderdyk	2	.
SS Maasdam	8	2
SS Ossendrecht	1	1
SS Prins Casimir	27	3
SS Prinses Margriet	4	. . .
SS Prinses Anna		2
SS Prins Maurits	21	1
SS Prins Willem 5	14	6
SS Tempo		1
SS Schiedyk		1
SS Schouwen	22	. .
SS Statendam	8	1
SS Tahama	7	....
SS Witmarsum	15	..
NORWAY		
SS Skrim	1	1
SS Justinian	2	.
SS Mesna	2	
SS Skiensfjord		2
SS Nordland	1	1
SS Bonnard	5	.
SS Belanthony		1
SS Gerore	1	1
SS Gerland		1
SS Topdalsfjord	10	3
SS Holthill	2	....
SS Breim	1	1
SS Livanita	46	3
SS Sandviken	14	....
SS Gezina Brovig	1	. . .
SS Foldenfjord	9	3
SS Bjorgsund		1
SS Berma	2	2
SS Francois	1	1
SS Oslofjord	27	3
SS Sagafjord	3	3
SS Eilert Rinde		1
SS Havmann	3	. .
SS Horda	39	.
SS Harald Brine		6
SS Vingnes		1
PANAMA		
SS Thalassa	1	1
POLAND		
SS Batory	10	11
SS Domekyo	3	....
SS Gryfpomorski	8	5
SWEDEN		
SS Halland	1	1
SS Nordia	.	1
SS Maj Ragne	7	1

Vessel	Weather Reports	Ice Reports
SWEDEN—Cont.		
SS Vreatholm		1
SS Kungsholm	6	1
SS Carlsholm	36	2
SS Sagaholm		1
SS Agne	13	
SS Gripsholm	37	3
SS Aurivaara		1
SS Tristan		1
SS Isolde	3	3
SS Caroline Smith	1	
UNION OF SOVIET SOCIALIST REPUBLICS		
SS Johannes Wares		2
SS Alexander Pushkin		1
SS Carl Linne		1
SS Grozny		3
UNITED KINGDOM		
SS Manchester Faith	11	2
SS Benalder	1	....
SS Rialto	24	3
SS Queen Mary	22	7
SS Assyria	2	
SS Santona	19	4
SS Laloma	1	1
SS Sheaf Field		1
SS Bamburgh Castle	4	1
SS Bristol City	12	3
SS Devon	2	1
SS Craigallian		1
SS City of Karachi	8	1
SS Manchester Fame	15	3
GFGH	2	
SS Phyllis Bowater		2
SS Newfoundland	37	7
SS Andania	19	
SS Alaunia	4	1
SS Crinan	2	2
SS Montcalm	12	
SS Bishopgate	1	2
SS Chusan	3	
SS Empress of Canada	28	3
HMS Alert		9
SS Letitia	11	4
SS Cheviot	28	
SS Dalesman	3	1
SS Riverton	2	2
SS Cape Nelson	25	1
SS Dukesgarth	17	
SS Salmela	2	2
SS Beaver Fir	9	3
SS Warkworth	8	2
SS Tidepool	5	
SS La Chacra	2	
SS Montreal City	19	2
SS Beaver Elm	20	2
SS Essequibo	2	3
SS Nova Scotia	4	3
SS Salvina	1	
SS Welsh Herald	14	2
SS Beaver Ash	15	1
SS Manchester Commerce	12	5
SS Ivernia	32	4
SS Media	7	1
SS Parthia	20	2
SS Saxonia	4	.
SS Victore		1
SS Halifax City	20	1
SS Scythia	7	3
SS Wearfield	7	2
SS Manchester City	4	
SS Roonagh Head	3	2
SS Samaria	5	3
SS Manchester Spinner	6	4
SS Cairn Gowan	23	
SS Manchester Exporter	6	1
SS Manchester Progress	2	1
SS British Envoy	20	
SS Nevasa	18	
SS Sicilia	23	
SS Coventry City	46	
SS Toronto City	3	....
SS Beaver Oak	19	5
SS Manchester Port	2	2
SS Gloucester City	8	2
SS Torquay		1
SS Esso Exeter		1
SS Matina	7	....
SS Manchester Trader	1	1
SS Scarborough	3	3
SS Naess Parkgate	1	1
SS Castilian	6	..
SS Scotia	24	1
SS Manchester Progress	6	3
SS Anatolian	4	
SS Dunadd	17	4
SS New York City	28	
SS Asia	8	3
SS Carinthia	1	7
SS Redcar	70	3
SS Lottinge		1
SS Dartwood		1
SS Ripon		1
SS Empress of England	10	2
SS Sylvania	7	6
SS Iron Ore	10	1
SS Sagamore	16	5
SS Nicolas Bowater	1	2
SS Dalhanna	7	1
SS Silversand	3	
SS Northdevon		1
SS Clarkeden	2	
SS Pennyworth		1
SS Manchester Freighter	15	7
SS Silver Craig		1
SS Caronia	5	1
SS Manchester Port	2	

Vessel	Weather Reports	Ice Reports
UNITED KINGDOM—Cont.		
SS Manchester Miller	18	4
SS Manchester Shipper	5	
SS Manchester Merchant	32	3
SS Oregis	11	
SS British Vigilance		1
SS Ribblehead	31	1
SS Fair Head	1	1
SS Galway	2	
SS Caxton	9	2
SS Golden Falcon	30	4
SS Irving Glenn	7	
UNITED STATES OF AMERICA		
SS Exiria	25	
SS Australian Isle	1	
SS American Forwarder	8	
SS John F. Shea	5	
SS American Press		1
SS American Scout	19	
SS American Traveler	3	
SS American Veteran	20	
SS Atlantic	5	....
SS American Charger	21	1
SS United States	20	
SS American Reliance	17	
SS American Rover	12	
SS Keystone State	12	
SS Mormac Elm	26	
SS Pioneer Cove	1	
SS Pioneer Tide	2	
SS American Corsair	19	
SS American Chieftain	14	5
SS Argentina	2	2
SS American Challanger	23	
SS American Champion	35	
SS Mormac Cargo	5	
SS Mormac Drago	4	

Vessel	Weather Reports	Ice Reports
UNITED STATES OF AMERICA—Cont.		
SS Mormac Crigel		1
UNITED STATES GOVERNMENT U.S. COAST GUARD		
USCGC Castle Rock	1	1
USCGC Casco	28	....
USCGC Mackinac	18	1
USCGC Edisto	12	4
USCGC Escanaba	29	15
USCGC Southwind	7	3
USCGC McCulloch	8	3
USCGC Bibb	11	3
USCGC Campbell	23	17
USCGC Ingham	13	8
USCGC Spencer	31	3
USCGC Owasco		5
USCGC Sebago	30	1
USCGC Mendota	49	2
USCGC Evergreen	264	45
USCGC Cook Inlet	45	8
U.S. NAVY		
USS Hayades	1	
U.S.N.S.		
USNS Shawnee Trail		1
USNS Norwalk	8	
USNS James W. Gilliss	3	1
USNS Greenville Victory	3	....
USNS Victoria	3	....
USNS Mirfak	41	2
YUGOSLAVIA		
SS Vares	6	..
SS Hercegovina	6	2

☆ U.S. GOVERNMENT PRINTING OFFICE: 1969 O—354-713

COAST GUARD

BULLETIN NO. 54

Report of the International Ice Patrol Service in the North Atlantic Ocean

SEASON OF 1968

CG–188–23

DEPARTMENT OF TRANSPORTATION

UNITED STATES COAST GUARD

Address reply to
COMMANDANT (OMS)
U.S. COAST GUARD
WASHINGTON, D.C.
20591

Transmitted herewith is Bulletin No. 54, Report of the International Ice Patrol Service in the North Atlantic Ocean, Season of 1968.

Dist: (SDL 89)
A: abcdefghmuv(1)
B: a(250), b(50 CEA, 5 CWA), e(10), cgq(2), mn(1)
C: abc(1)
D: s(35), i(2), lux(1)
E: None
F: None
SML: 133

TABLE OF CONTENTS

PREFACE

This Bulletin is No. 54 in a series of annual reports on the International Ice Observation and Ice Patrol Services. The authority for the mission, forces assigned, and method of operation of the International Ice Patrol during the 1968 season are described.

Aerial ice observation and communication statistics are presented.

All ships reporting ice and weather to the International Ice Patrol in 1968 are tablulated. Figures illustrating ice conditions for the Grand Banks are included. Two hundred and nineteen bergs drifted south of latitude 48°N. during the season. The most southerly berg of the season was reported on 12 May in position 42°27′N., 48°50′W. The duration and extension of the pack ice to the south and east of Newfoundland was well below average, the southernmost extension occurring on 26 April at 48°40′ N., 52°30′W.

Rear Admiral A. J. CARPENTER, U.S.C.G. was Commander, International Ice Patrol. Commander J. E. MURRAY, U.S.C.G. was directly responsible for the management of the Patrol.

The author of this Bulletin, Commander J. E. MURRAY, U.S.C.G. acknowledges the assistance provided in the preparation of the illustrations and manuscript by Chief Aerographer's Mate W. F. VAN GAASBECK, U.S.C.G., Yeoman First Class H. M. KERN, U.S.C.G., and Aerographer's Mate Third Class J. A. THAW, U.S.C.G.

INTERNATIONAL ICE PATROL—1968

The International Ice Patrol Service for 1968 was carried out by the U.S. Coast Guard in accordance with the provisions of the International Convention for the Safety of Life at Sea, 1960, and the United States Code, Title 46, Sections 738, 738a through 738d. The mission of protecting shipping from ice was accomplished by collecting ice information from all available sources and disseminating it twice daily by radio broadcasts and daily by facsimile.

The Ice Patrol forces were:

- Commander, International Ice Patrol and his staff
- Ice observers in Argentia
- Coast Guard Radio Station Argentia (NIK/NJN)
- Hercules HC–130B aircraft deployed on temporary duty from U.S. Coast Guard Air Station Elizabeth City, North Carolina to Argentia, Nfld.
- Surface Patrol Vessel, U.S.C.G.C. *Acushnet.*
- Oceanographic vessel, U.S.C.G.C. *Evergreen.*

The distribution of ice made it unnecessary to utilize a surface patrol vessel for the ninth consecutive year. This was the second year that Commander, International Ice Patrol directed the patrol from U.S. Coast Guard Base, Governor's Island, New York.

Ice Patrol aircraft and their crews, ice observers, additional radiomen for the Ice Patrol radio station (NIK), and other support personnel, deployed to Argentia on 20 February 1968 to open the ice observer's office. Communication links with the Commander, International Ice Patrol, New York were tested and put into use. Aerial ice reconnaissance began with a flight on 24 February. On 14 March 1968 the season opened with the first broadcast.

The Ice Patrol staff directed flights, received ice and environmental reports, maintained plots and forecast ice conditions, prepared ice broadcasts and ice bulletins, and answered special requests for ice information. Periodically throughout the ice season the Ice Patrol Officer deployed to Argentia for first hand observations of the existing ice conditions.

The Ice Patrol officially terminated on 21 July. The operation of the Service from September 1967 through August 1968 is summarized as follows:

- Two northern aerial iceberg surveys were made into Baffin Bay; one survey in September and one in December 1967.
- One pre-season ice reconnaissance flight was made in January 1968 to guard against an undetected early ice threat to the shipping lanes.
- Seventy six ice reconnaissance flights were made during the season.
- Two post-season flights were made in August to guard against an undetected late ice threat to the shipping lanes.
- Ice and weather reports and sea surface temperatures were collected and analyzed.
- Ice conditions were forecast every twelve hours.
- Ice broadcasts were made up and transmitted every twelve hours.
- Ice bulletins were sent out every twelve hours to interested agencies.
- Ice facsimile charts were broadcast daily.
- Special ice information was provided on request.
- Position plots were maintained on all ships sending in ice and weather and sea temperature reports to the Ice Patrol.
- During three oceanographic cruises by the U.S.C.G.C. *Evergreen*, eight oceanographic surveys of the Grand Banks were carried out.

AERIAL ICE RECONNAISSANCE

Seventy six ice observation flights were made during the season. Radar aided the ice observers in locating possible icebergs in bad visibility and doppler navigation was used to determine the position of ice. During parts of the Patrol, microwave radiometer was available to aid in identifying radar targets in bad visibility.

Flight statistics are presented in Table 1.

Table 1.—Aerial Ice Reconnaissance Statistics—September 1967 through August 1968.

Month	No. of flights	No. days flights made	Average visual effectiveness (percentage)**	Maximum number days between flights	Hours flown
Sep	1	NA	90.0	NA	37.5
Oct	0	NA	NA	NA	NA
Nov	0	NA	NA	NA	NA
Dec	1	NA	50.0	NA	28.6
Jan	1	NA	90.0	NA	22.1
Feb	4	4	75.0	NA	26.5
Mar	10	10	84.5	6	57.1
Apr	15	15	60.0	4	81.2
May	20	16	59.6	4	103.6
Jun	13	13	62.3	6	74.0
Jul	14	12	52.0	4	70.5
Aug	2	2	92.5	NA	12.2

* Ratio ($\times 100$) of area actually searched visually to area planned to be searched.

Table 2.—Communication Statistics.

Number of ice reports received	398
Number of ships furnishing ice reports	178
Number of sea surface temperature reports	2271
Number of vessels furnishing sea surface temperatures	327
Number of vessels requesting special information	47

Percentage Distribution of Reporting Vessels by Nationality

United Kingdom	33.8
United States of America	12.9
Federal Republic of Germany	12.5
Norway	6.5
Sweden	5.3
France	4.9
Netherlands	3.8
Union of Soviet Socialist Republics	3.4

Table 2.—Communication Statistics.—Cont.

Percentage Distribution of Reporting Vessels by Nationality—Cont.

Liberia	3.0
Italy	2.3
Canada	1.5
Ireland	1.5
Japan	1.5
Belgium	1.5
Finland	1.1
Yugoslavia	1.1
Poland	0.7
Nigeria	0.7
Spain	0.4
Panama	0.4
Denmark	0.4
India	0.4
Mexico	0.4
Total	100.0

COMMUNICATIONS

From 14 March to 21 July ice information was broadcast twice daily to shipping by International Ice Patrol Radio Station (NIK) at 0018 and 1218 G.M.T. simultaneously on 427, 5320, 8502, and 12880.5 KHZ. Each broadcast was preceded by the general call CQ on 500 KHZ with instructions to shift to the above operating frequencies. A two minute series of test signals transmitted on the operating frequencies facilitated receiver tuning. Each broadcast was transmitted twice, first at 25 words per minute and again at 15 words per minute. In addition to ice broadcasts, ice broadcasts, ice bulletins were transmitted by teletype to a number of organizations including the U.S. Naval Oceanographic Office, the Canadian Department of Transport, and the Canadian Forces Radio Station at Albro Lake, Nova Scotia. The Naval Oceanographic Office further disseminated the Bulletins via U.S. Naval Radio Station Washington (NSS), and daily and weekly Notices to Mariners.

Ice conditions were also transmitted by facsimile at 1330 G.M.T. daily on 5320, 8502, and 12880.5KHZ at a drum speed of 60 R.P.M.

Duplex radio operations were used between NIK and merchant ships for general radio communications. Merchant ships worked NIK on 500 KHZ and 8 and 12 MHZ maritime calling bands. NIK worked 427, 8734, and 12718.5 KHZ as appropriate.

The International Ice Patrol Radio Station (NIK) is also Coast Guard Radio Station Argentia (NJN). About half of the traffic it handles during the ice season concerns Ice Patrol services, and the rest is Coast Guard traffic. Statistics concerning ships reporting to or requesting information from Commander, International Ice Patrol are presented in Table 2.

OBSERVED ICE CONDITIONS AND THE ENVIRONMENT

In order to permit timely publication of the Ice Patrol Bulletin each year, as well as because the Ice Patrol operates on a seasonal cycle from September through August, iceberg statistics published in this Bulletin are presented for an annual cycle of September to August. To permit comparison with previous years, iceberg statistics reflecting this change for the years 1900–1968 are presented in Table 3.

Table 3.—Estimated Number of Icebergs South of Latitude 48°N, 1900–1968

Season	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Total
1900	0	0	0	0	10	0	0	5	32	33	6	1	87
1901	1	1	0	0	1	0	0	4	13	29	22	6	77
1902	5	1	2	5	3	0	1	1	13	5	16	1	53
1903	0	1	0	0	0	2	400	166	151	52	23	7	802
1904	0	0	0	1	0	0	12	63	82	89	14	3	264
1905	2	0	0	0	3	2	168	373	109	100	50	9	816
1906	8	8	0	15	14	11	77	49	133	87	18	16	436
1907	0	0	0	0	0	1	11	162	248	138	64	11	635
1908	0	0	0	3	1	0	7	39	82	51	2	2	187
1909	20	15	3	0	0	55	147	134	321	181	121	45	1,042
1910	19	1	0	0	0	0	0	34	10	3	0	0	70
1911	0	0	0	0	0	8	41	112	72	77	21	40	371
1912	3	0	8	14	1	0	34	395	345	159	63	19	1,041
1913	0	0	3	0	2	4	37	109	292	71	14	4	536
1914	7	0	6	4	1	41	32	27	419	71	22	46	676
1915	52	13	1	6	14	72	67	96	97	71	28	17	534
1916	5	0	1	0	0	0	0	0	25	29	0	0	60
1917	0	0	0	0	0	0	13	3	3	9	10	0	38
1918	0	0	0	0	0	0	12	23	26	37	27	34	159
1919	22	1	14	3	3	4	5	25	75	56	26	36	270
1920	69	2	12	4	6	43	20	5	211	86	18	5	481
1921	18	19	10	4	17	5	43	210	198	175	53	24	776
1922	4	10	1	6	0	3	35	71	245	83	21	11	490
1923	6	27	21	0	0	3	28	65	83	42	10	3	288
1924	2	0	0	0	3	0	6	2	0	0	0	0	13
1925	0	0	0	0	0	3	5	8	58	22	13	00	109
1926	0	0	0	0	0	3	15	58	168	85	4	6	339
1927	2	3	1	0	4	10	26	93	153	95	5	3	395
1928	0	0	0	0	0	0	14	156	190	87	55	5	507
1929	0	4	4	0	0	0	15	332	460	376	107	1	1,329
1930	0	0	18	12	14	116	87	89	101	62	3	1	503
1931	1	1	0	0	0	0	2	1	10	0	0	0	15
1932	0	0	0	0	0	1	43	321	90	58	1	0	514
1933	0	0	0	0	0	2	4	12	162	36	0	0	216
1934	0	0	0	0	1	0	0	245	228	87	14	1	576

Season	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Total
1935	0	0	0	0	0	0	46	177	501	134	11	3	872
1936	0	0	0	3	0	0	0	8	14	0	0	0	25
1937	0	0	0	0	20	53	121	124	137	14	1	0	470
1938	0	0	0	0	2	3	38	212	286	110	13	0	664
1939	0	0	0	0	0	0	22	173	471	150	28	6	850
1940	0	0	0	0	0	0	0	0	1	0	0	0	1
1941	0	0	1	0	0	0	0	1	1	0	0	0	3
1942	0	0	0	0	0	0	30	0	0	0	0	0	30
1943	0	0	0	0	0	0	25	90	298	270	150	7	840
1944	0	0	0	0	0	0	31	319	213	106	30	1	700
1945	0	0	0	0	0	6	352	253	256	92	109	15	1,083
Total 1900–45	246	107	106	80	120	451	2,102	4,845	7,083	3,518	1,196	389	20,243
Average 1900–45	5.3	2.3	2.3	1.7	2.6	9.8	45 7	105.3	154.0	76.5	26.0	8.4	440.1
1946	0	0	0	0	0	2	67	98	168	88	7	0	430
1947	0	0	0	0	3	1	2	5	11	26	15	0	63
1948	0	0	0	0	0	0	60	210	185	68	0	0	523
1949	0	0	0	0	0	0	1	23	20	3	0	0	47
1950	0	0	0	0	0	12	61	183	135	58	7	0	456
1951	1	1	2	0	0	3	2	0	0	0	0	0	9
1952	0	0	0	1	0	0	0	12	2	0	0	0	15
1953	0	0	0	0	0	0	21	11	18	6	0	0	56
1954	0	0	0	0	1	16	47	165	65	16	2	0	312
1955	0	0	0	0	0	0	10	32	14	5	0	0	61
1956	0	0	0	0	0	0	9	13	34	21	3	0	80
1957	0	0	0	0	3	43	41	172	265	288	113	6	931
1958	0	0	0	0	0	0	0	0	0	0	1	0	1
1959	0	0	0	0	0	0	14	266	180	186	43	0	689
1960	0	0	2	3	3	0	41	161	44	4	0	0	285
1961	0	0	0	0	0	6	60	30	16	1	0	1	114
1962	0	1	0	1	0	0	14	72	21	10	3	0	122
1963	0	0	0	0	0	0	4	20	0	0	1	0	25
1964	0	0	0	0	0	3	88	225	19	28	5	1	369
1965	0	0	0	0	0	1	19	33	22	1	0	0	76
1966	0	0	0	0	0	0	0	0	0	0	0	0	0
1967	0	0	0	0	0	0	25	134	209	65	8	0	441
1968	0	0	0	0	0	0	0	104	44	60	14	4	226
Total 1946–68	1	2	4	5	10	87	586	1,969	1,472	934	222	12	5,304
Average 1946–68	0	0.1	0.2	0.2	0.4	3.8	25.5	85.6	64.0	40.6	9.7	0.5	230.6
Total 1900–68	247	109	110	85	130	538	2,688	6,814	8,555	4,452	1,418	401	25,547
Average 1900–68	3.6	1.6	1.6	1.2	1.9	7.8	39.0	98.8	24.0	64.5	20.6	5.8	364.4

Note:

1. Totals for 1900–45 are based mainly on ship reports.
2. Totals for 1946–68 are based mainly on Ice Patrol aircraft reconnaissance.
3. Monthly estimates for the years 1939 through 1944 have been adjusted to reflect the total annual berg estimates as reported in the Bulletins for these years.

Pre-season aerial ice reconnaissance had indicated the possibility of a very heavy ice season, refer to figures 1 and 2, but as the season progressed favorable winds drifted many more bergs than had been expected out of the Labrador Current. Figures are provided to illustrate the movement of ice into the Grand Banks area. The sources of ice information were the

reconnaissance patrols of the Ice Patrol aircraft, reports from ships and aircraft, both military and civilian, transitting the area, ice reconnaissance flights by the U.S. Naval Oceanographic Office along the Labrador Coast, and ice reconnaissance flights by the Canadian Department of Transport in the Gulf of St. Lawrence, Newfoundland coastal waters, and along the Labrador Coast.

Some environmental factors that affect the drift and deterioration are the wind, the currents (both density and wind driven), and the temperature of the water. Charts of the weekly average surface pressure (a measure of both the wind affect on the iceberg and the wind driven ocean current) are arranged to face the chart of observed ice conditions for that week. Charts of the average sea temperature to 150 meters and the geostrophic (density) current, obtained from *Evergreen's* oceanographic surveys, and charts of the bi-weekly sea surface temperature, obtained from ship reports, are presented. For a detailed discussion of the oceanography of this region during this year's surveys, refer to the appropriate U.S. Coast Guard Oceanographic Report (CG–373 series).

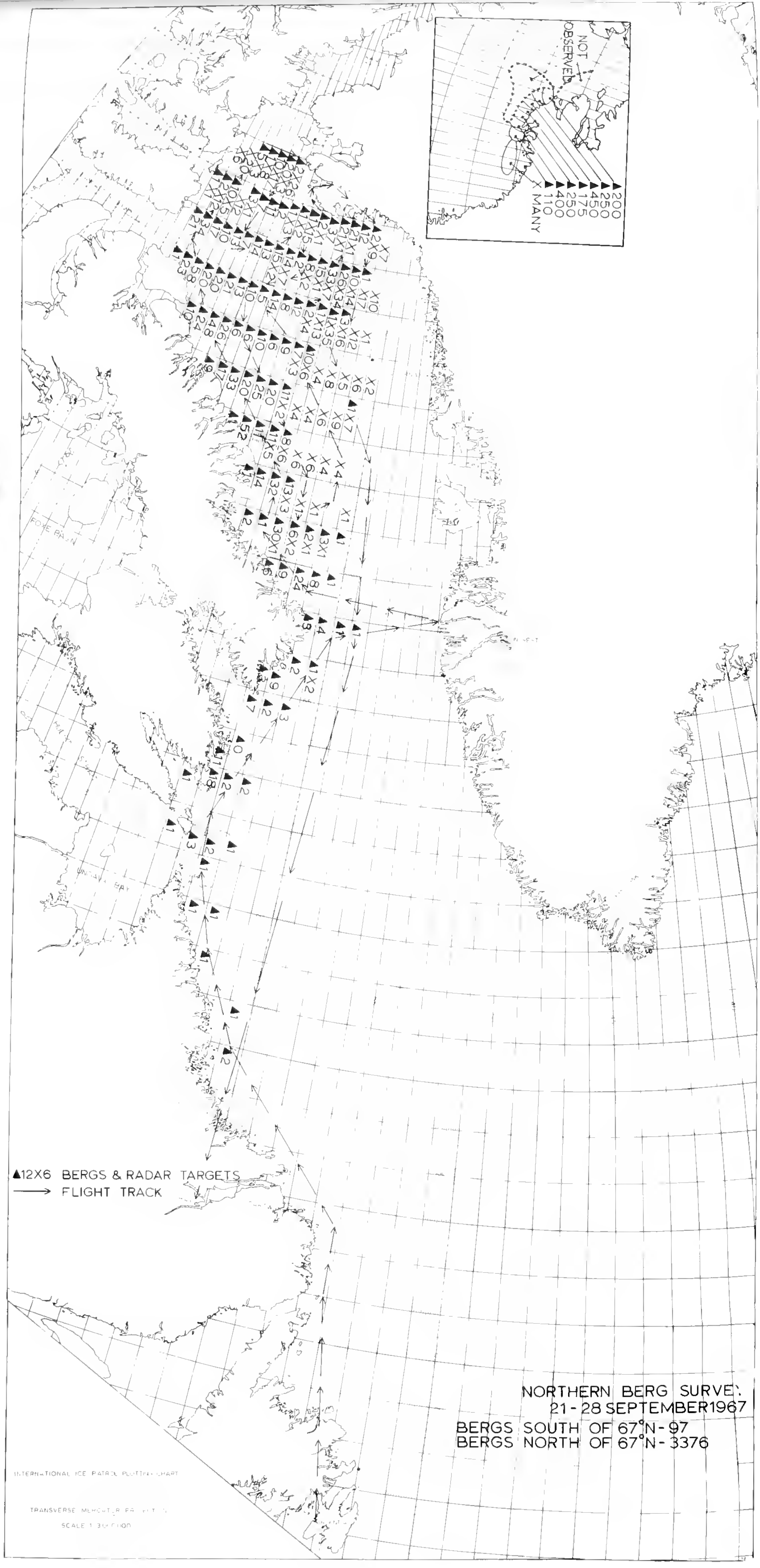


Figure 1—Ice Conditions, 21-28 September 1967.

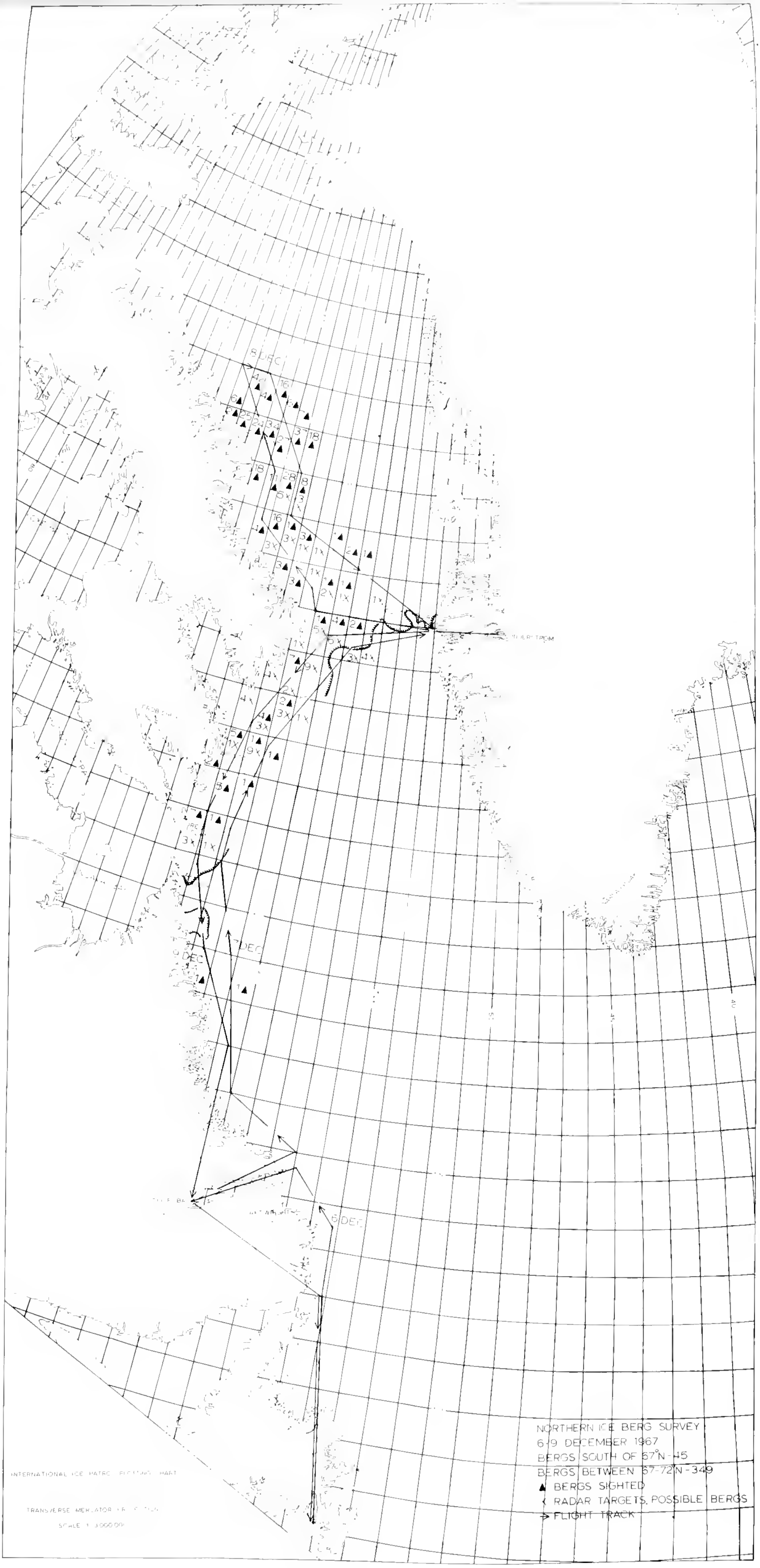


Figure 2 —Ice Conditions, 6-9 December 1967

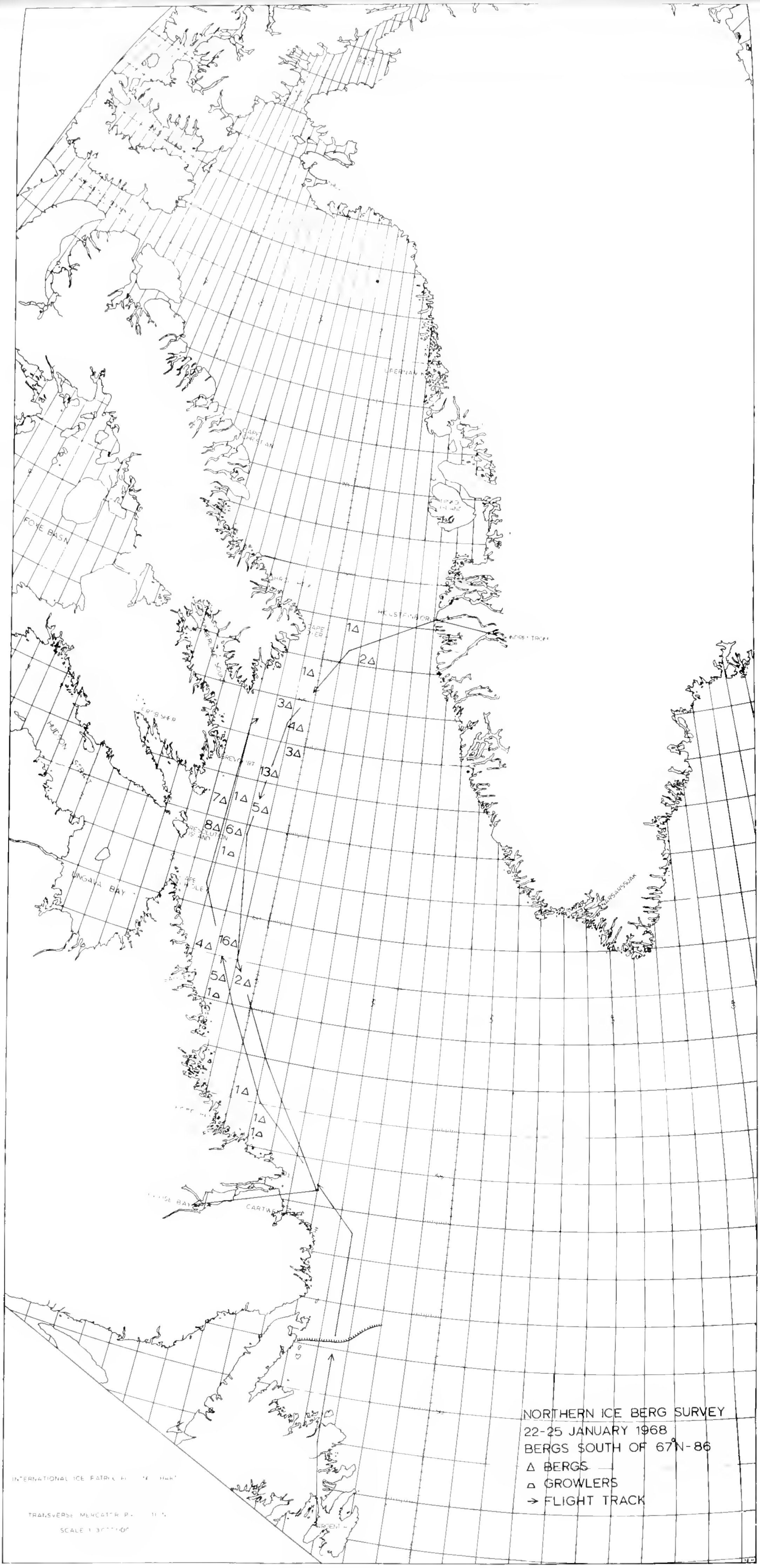


Figure 3 —Ice Conditions, 23 and 24 January 1968.

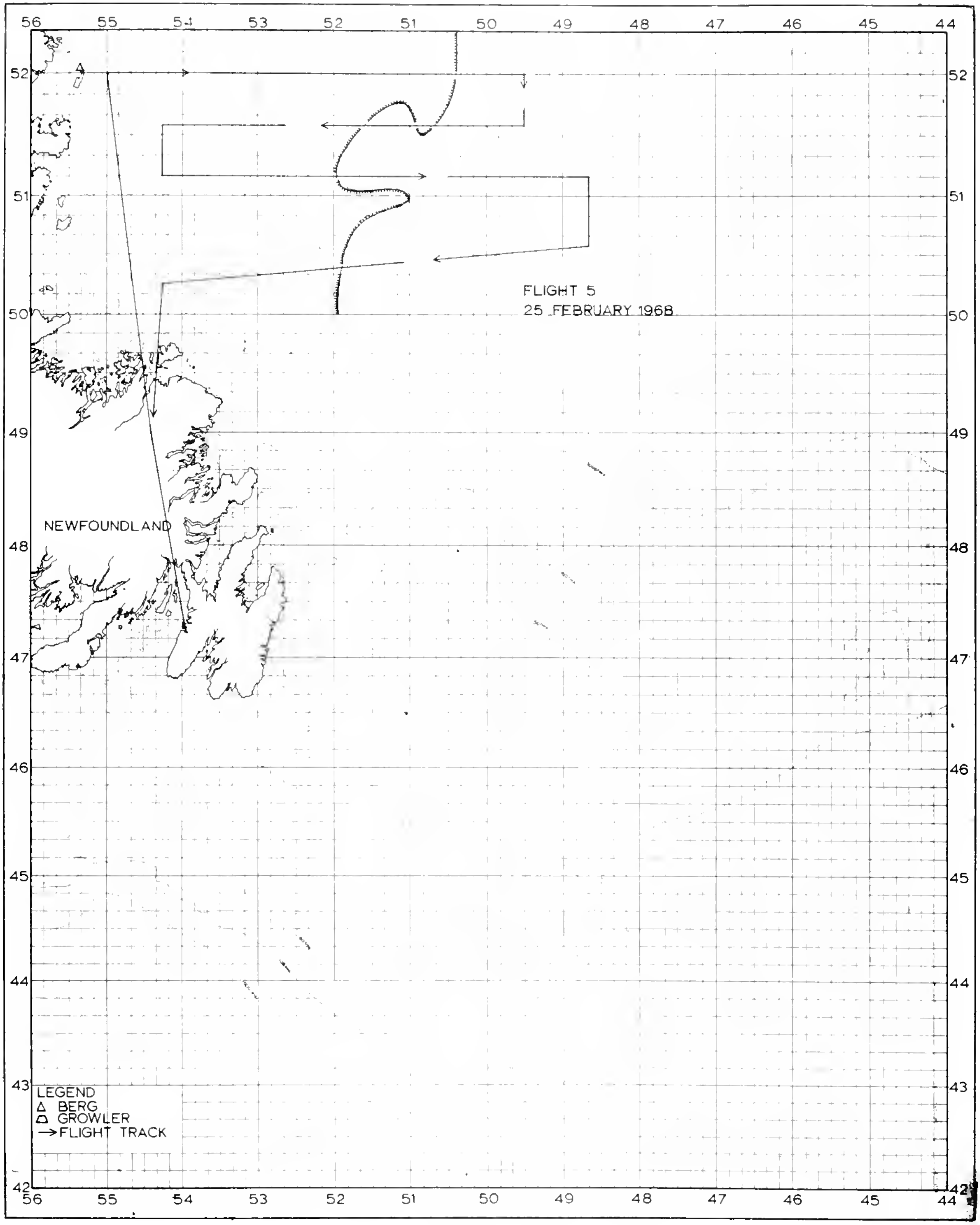


Figure 4.—Ice Conditions, 25 February 1968.

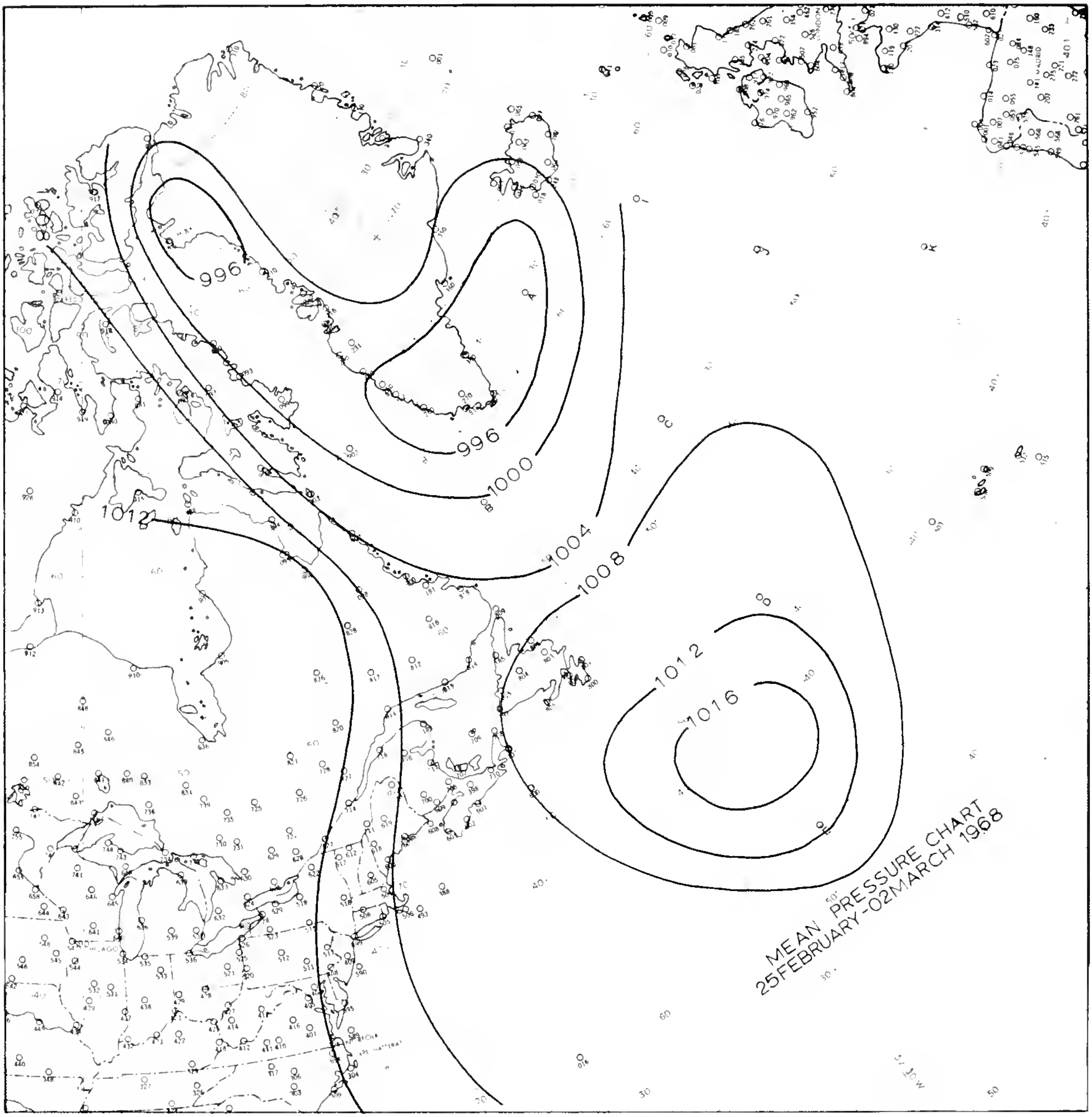


Figure 5.—Average Weekly Surface Pressure 24 February–2 March 1968.

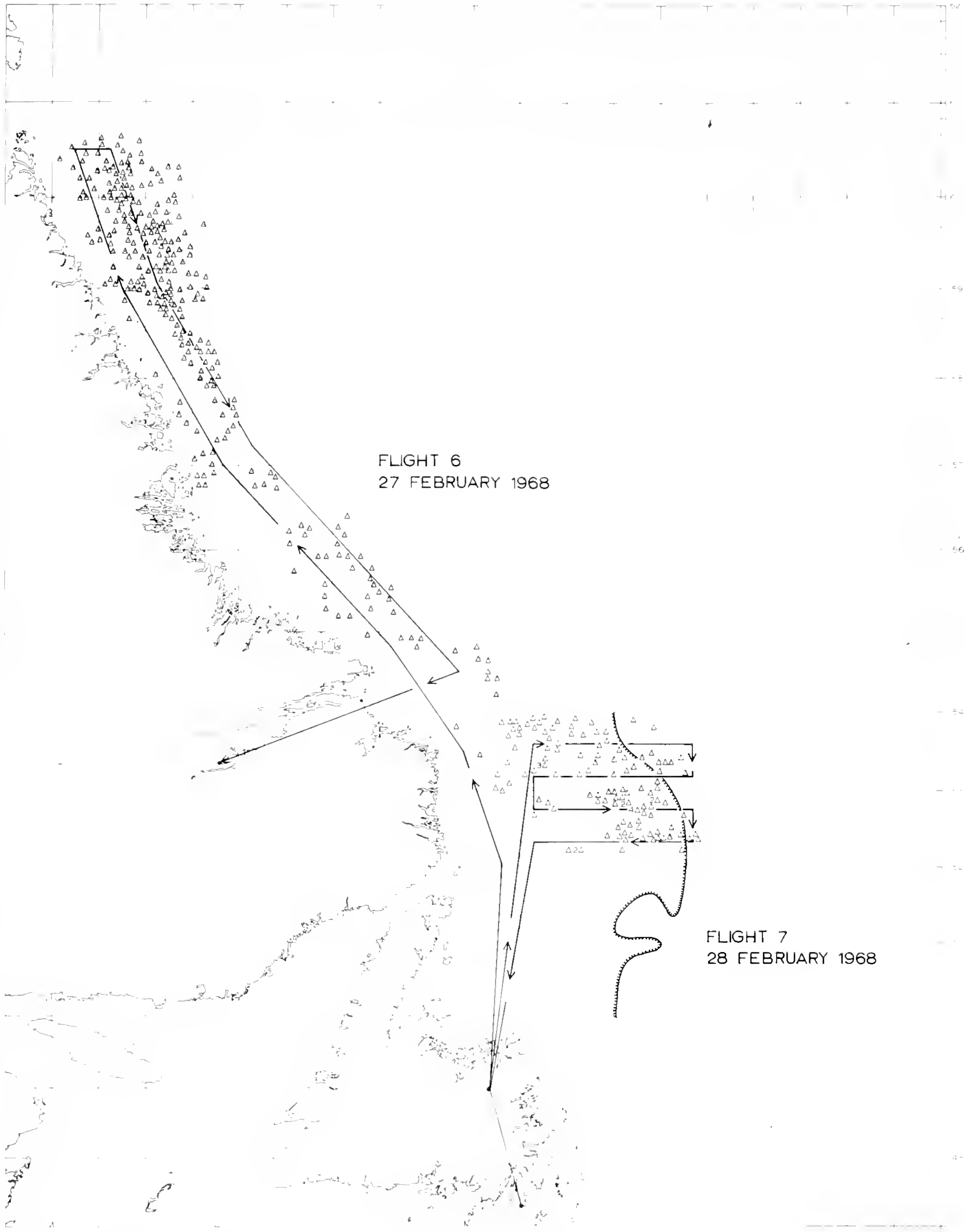


Figure 6.—Ice Conditions, 27–28 February 1968.

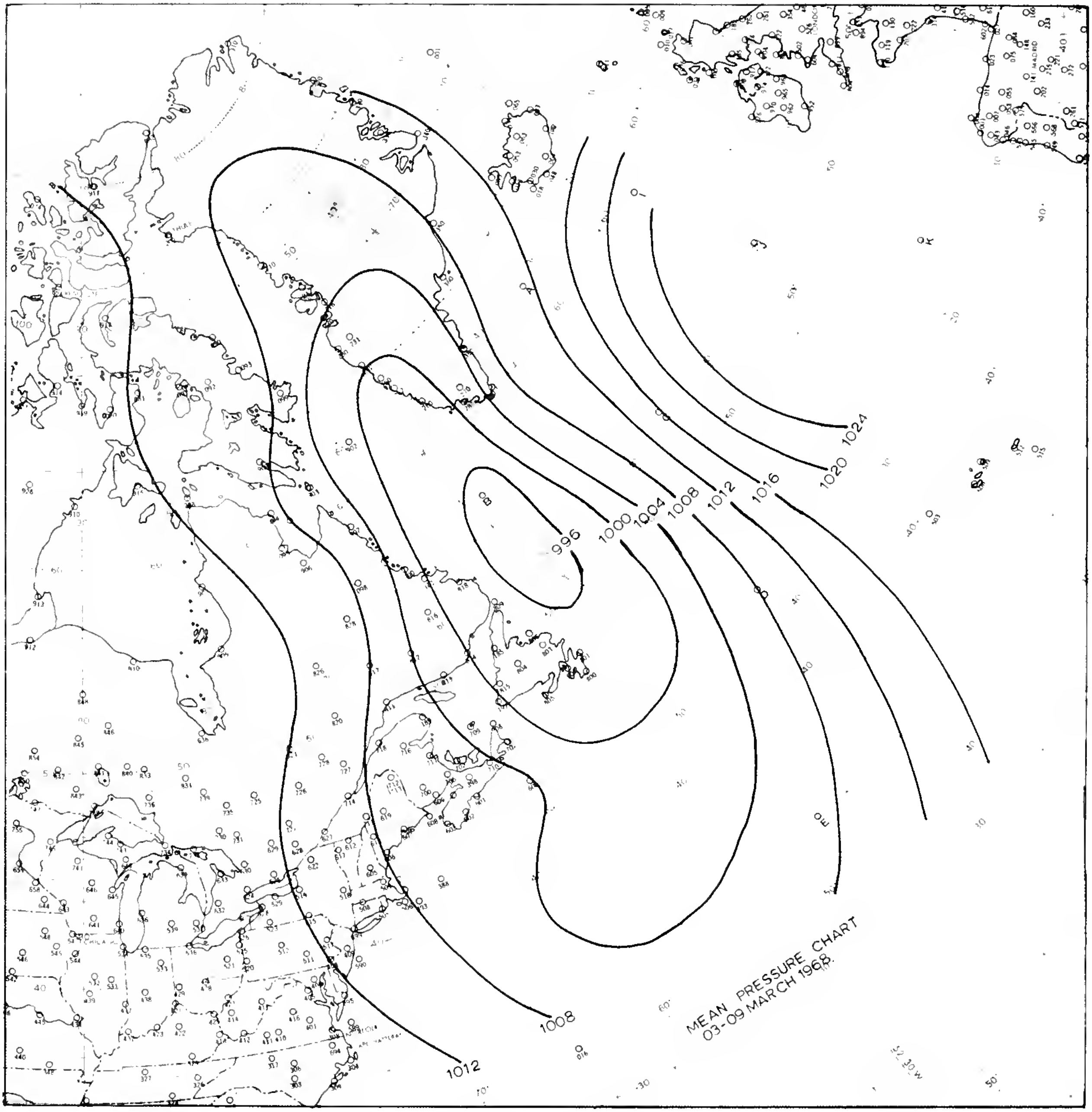


Figure 7.—Average Weekly Surface Pressure, 3–9 March 1968.

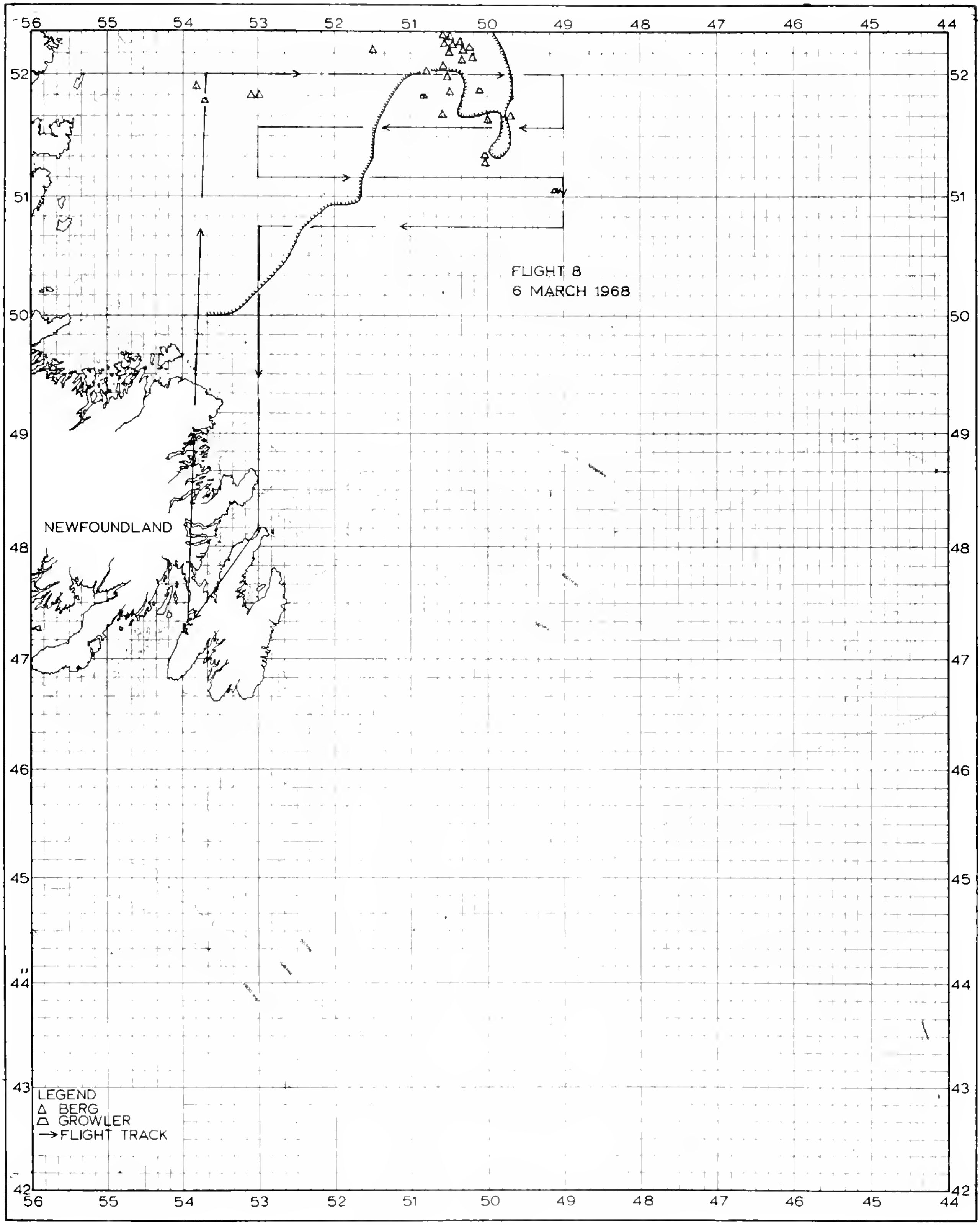


Figure 8.—Ice Conditions, 6 March 1968.

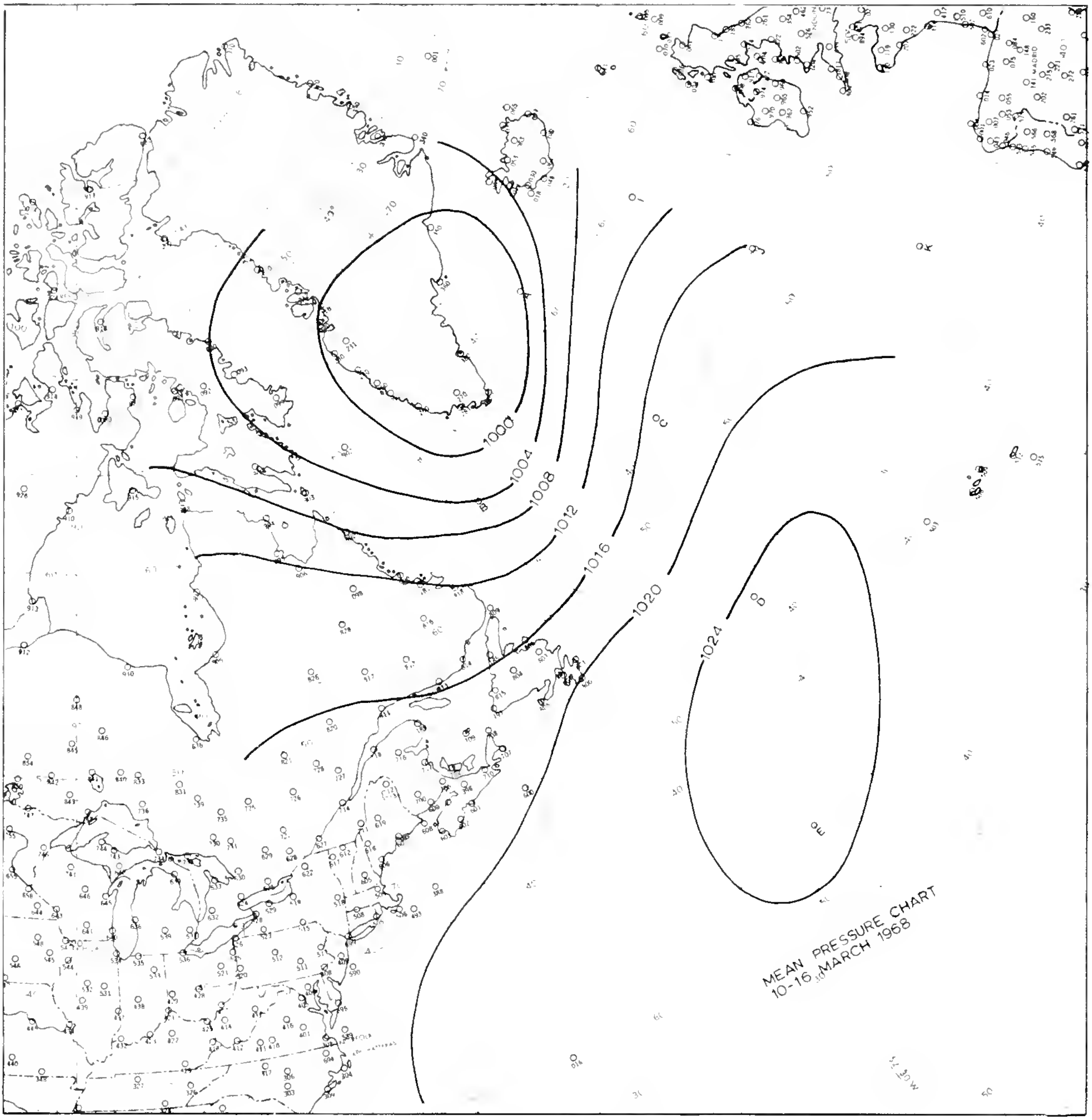


Figure 9.—Average Weekly Surface Pressure, 10–16 March 1968.

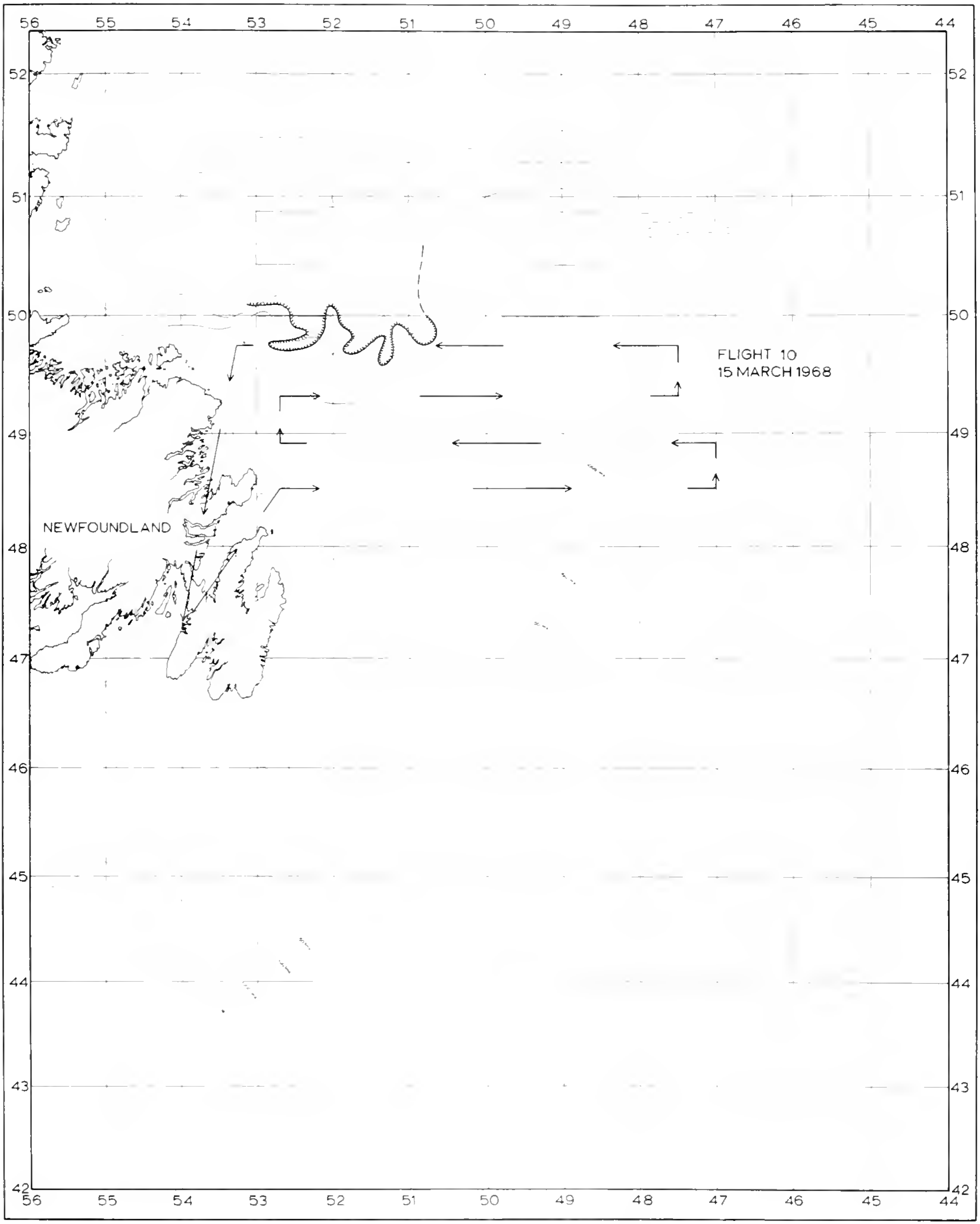


Figure 10.—Ice Conditions, 15 and 16 March 1968.

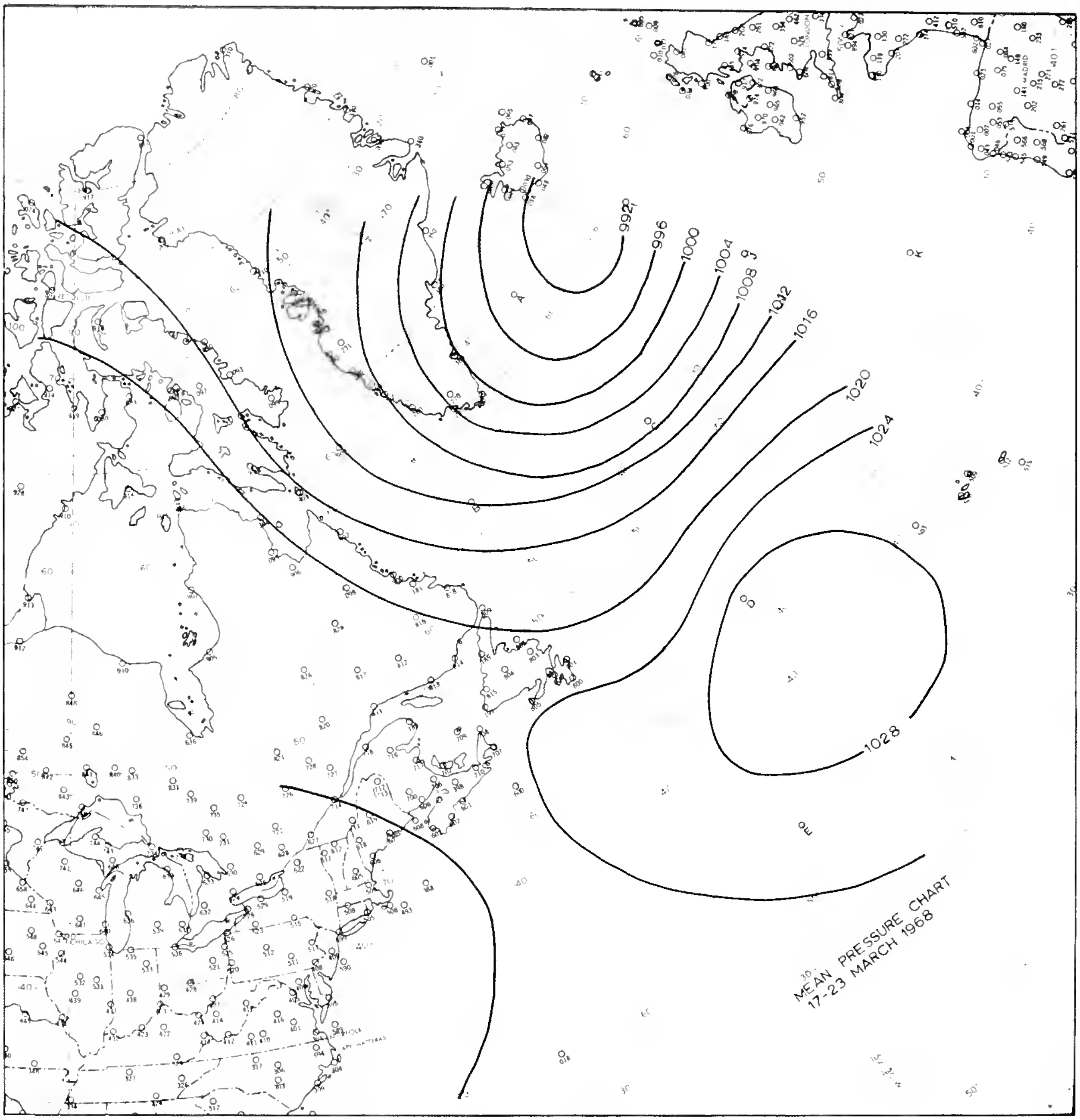


Figure 11.—Average Weekly Surface Pressure, 17–23 March 1968.

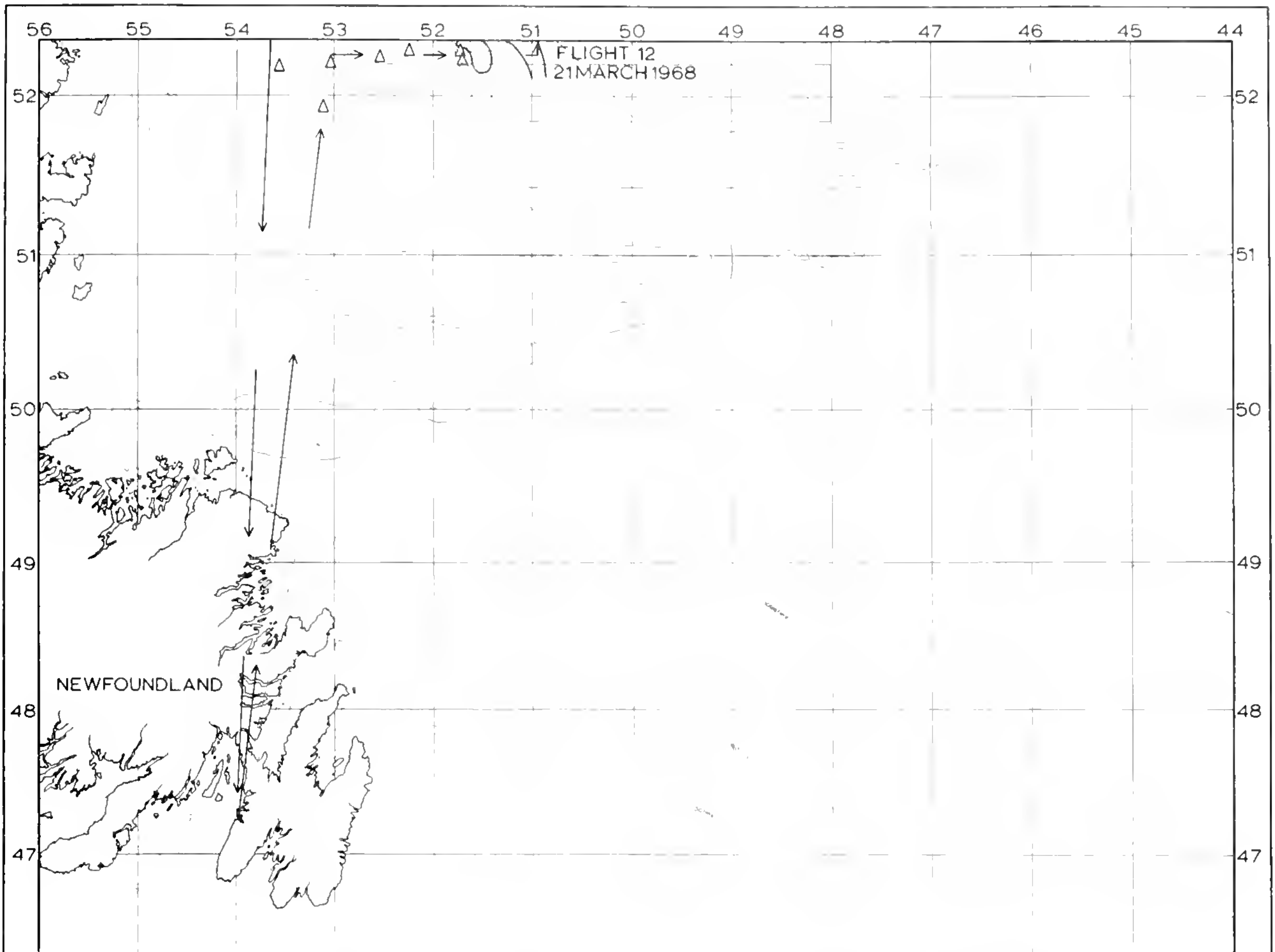


Figure 12.—Ice Conditions, 21 and 22 March 1968.

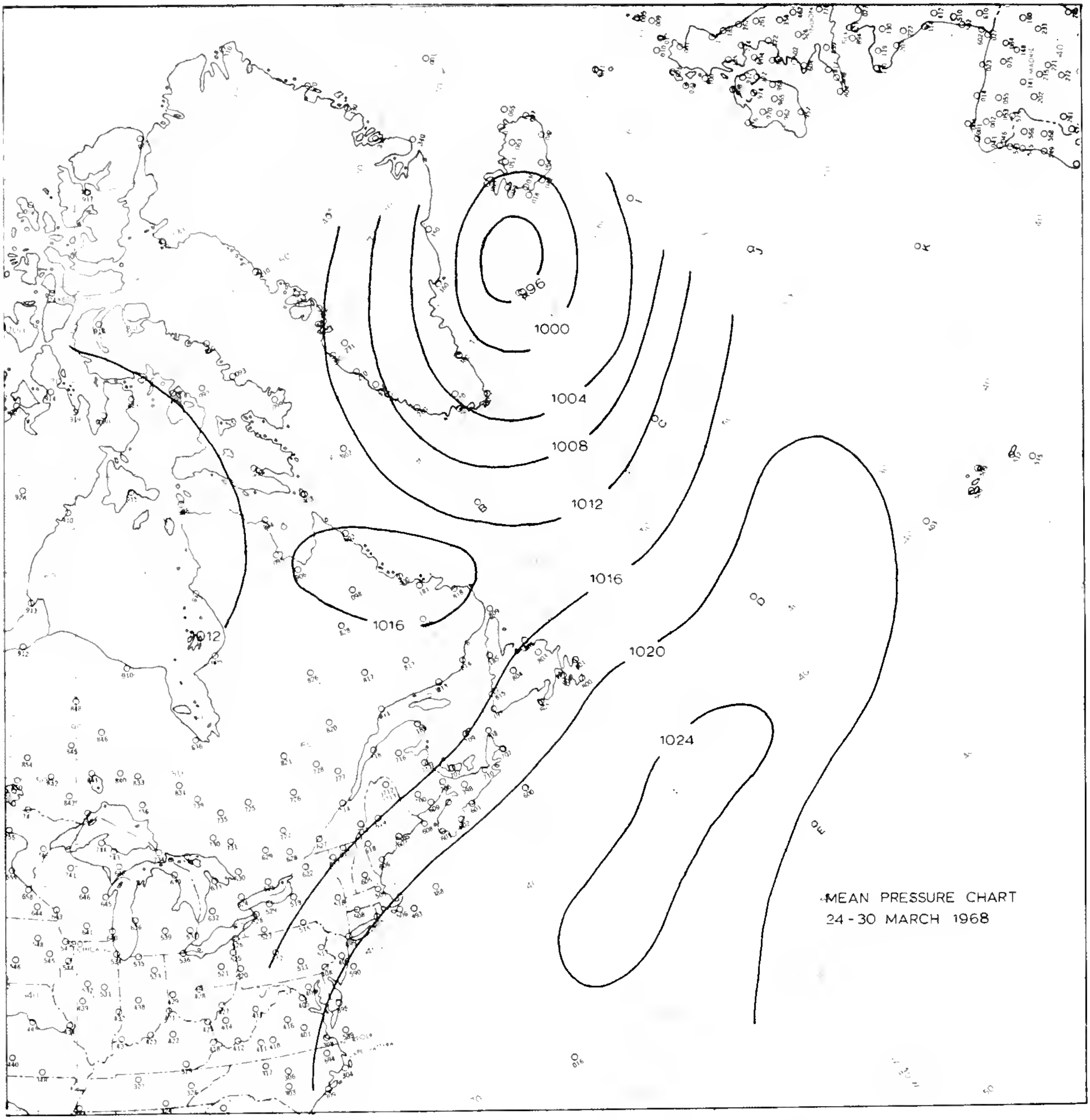


Figure 13.—Average Weekly Surface Pressure, 24–30 March 1968.

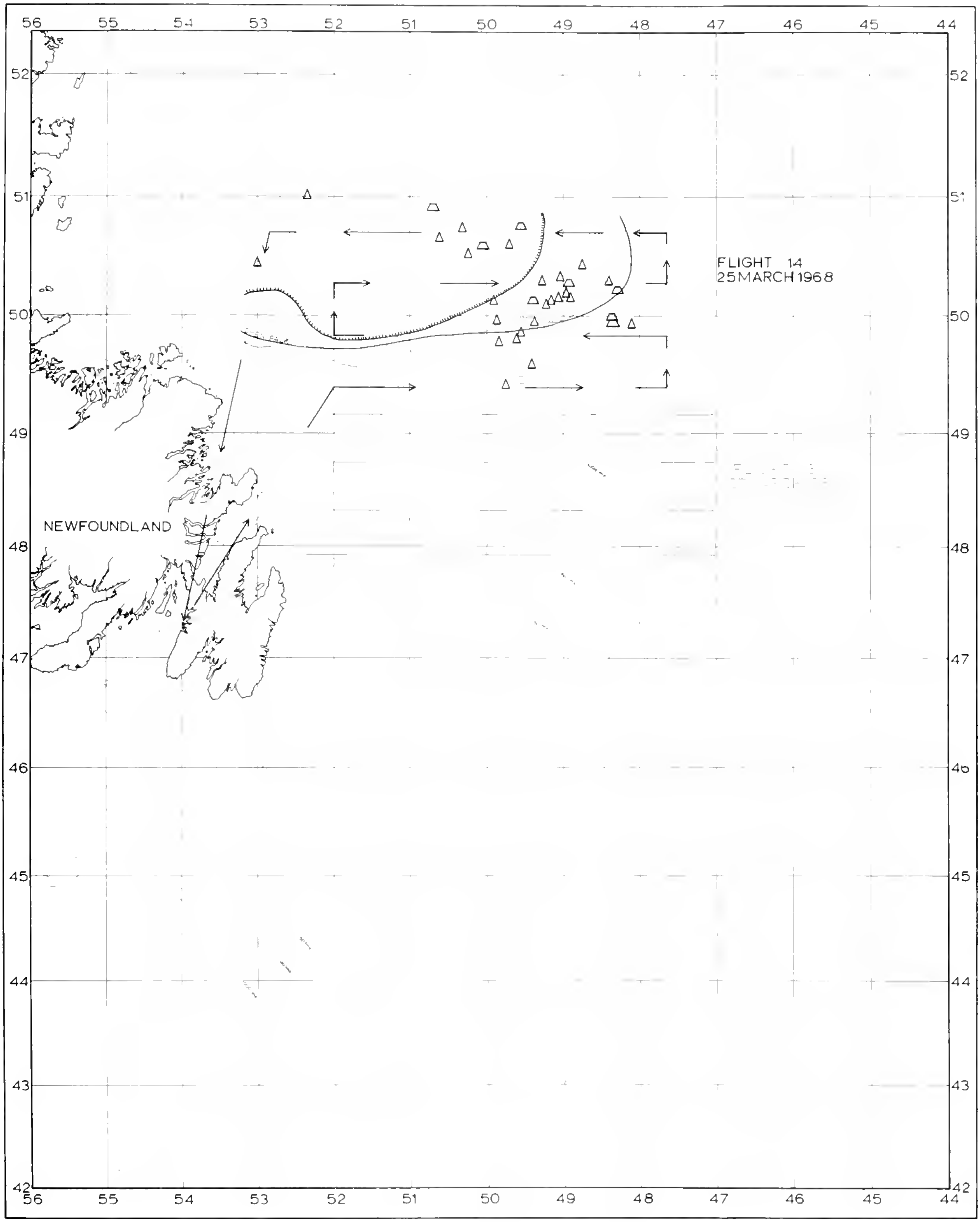


Figure 14.—Ice Conditions, 25–27 March 1968.

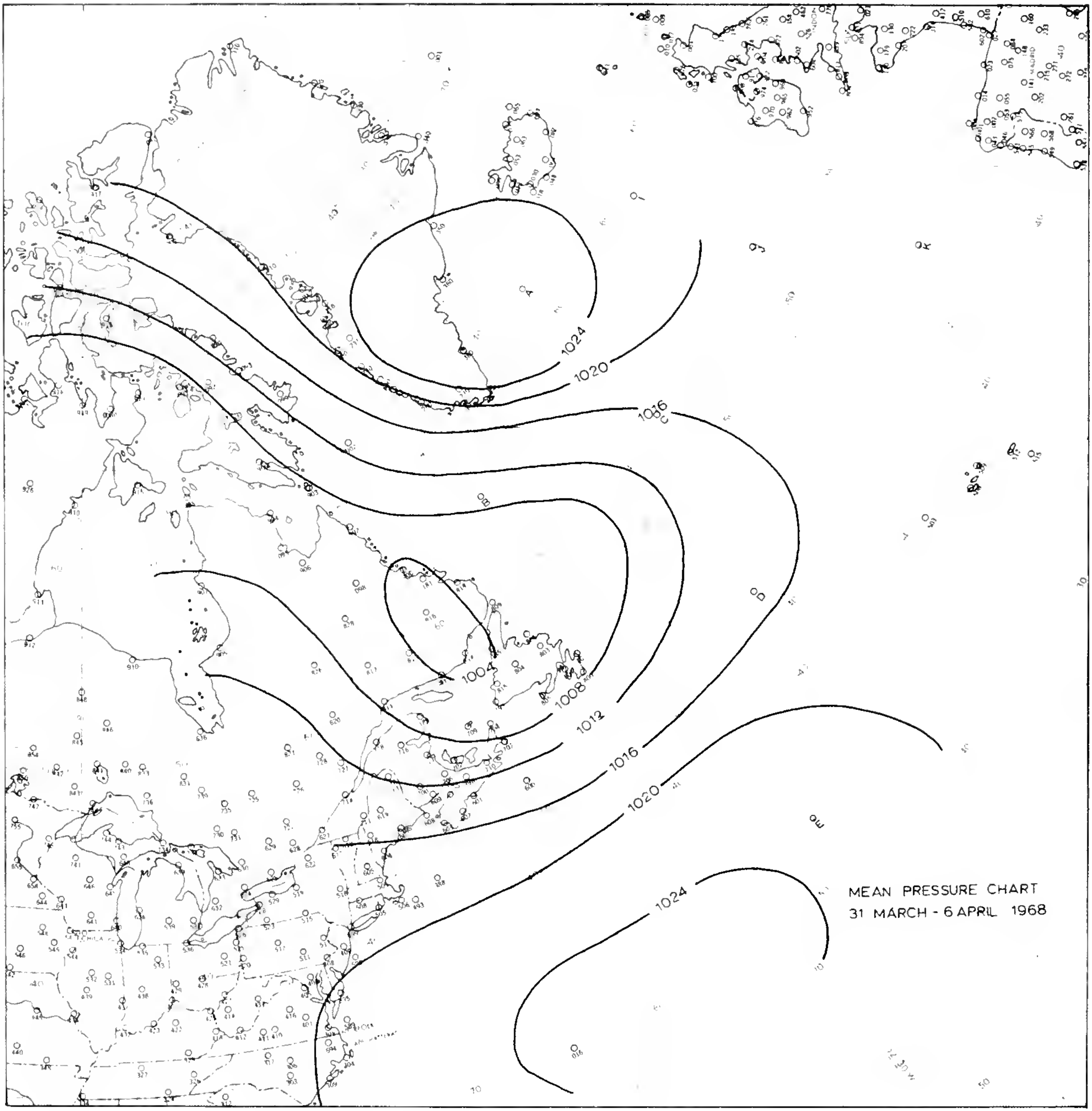


Figure 15.—**Average Weekly Surface Pressure, 31 March–6 April 1968.**

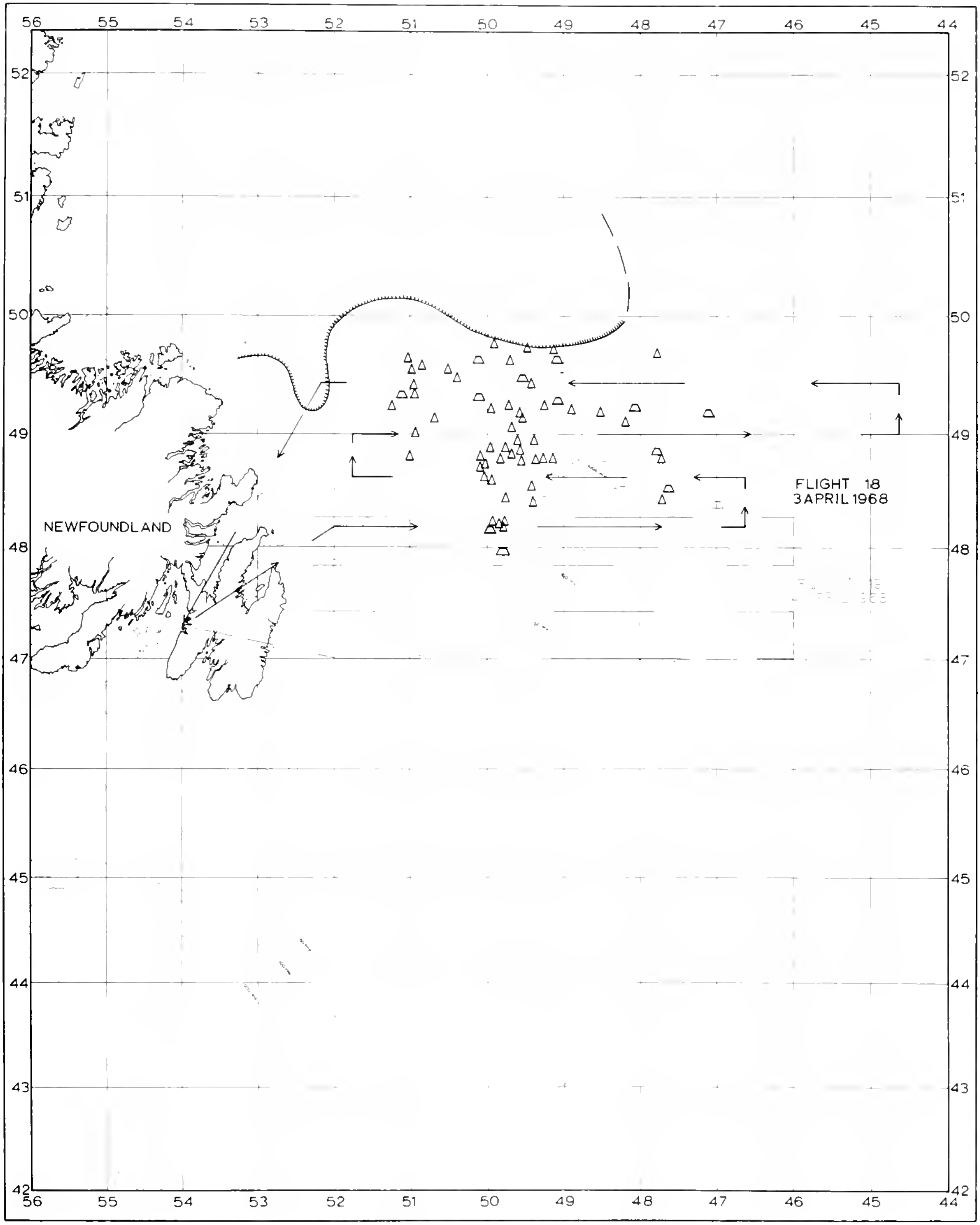


Figure 16.—Ice Conditions, 3 and 4 April 1968.

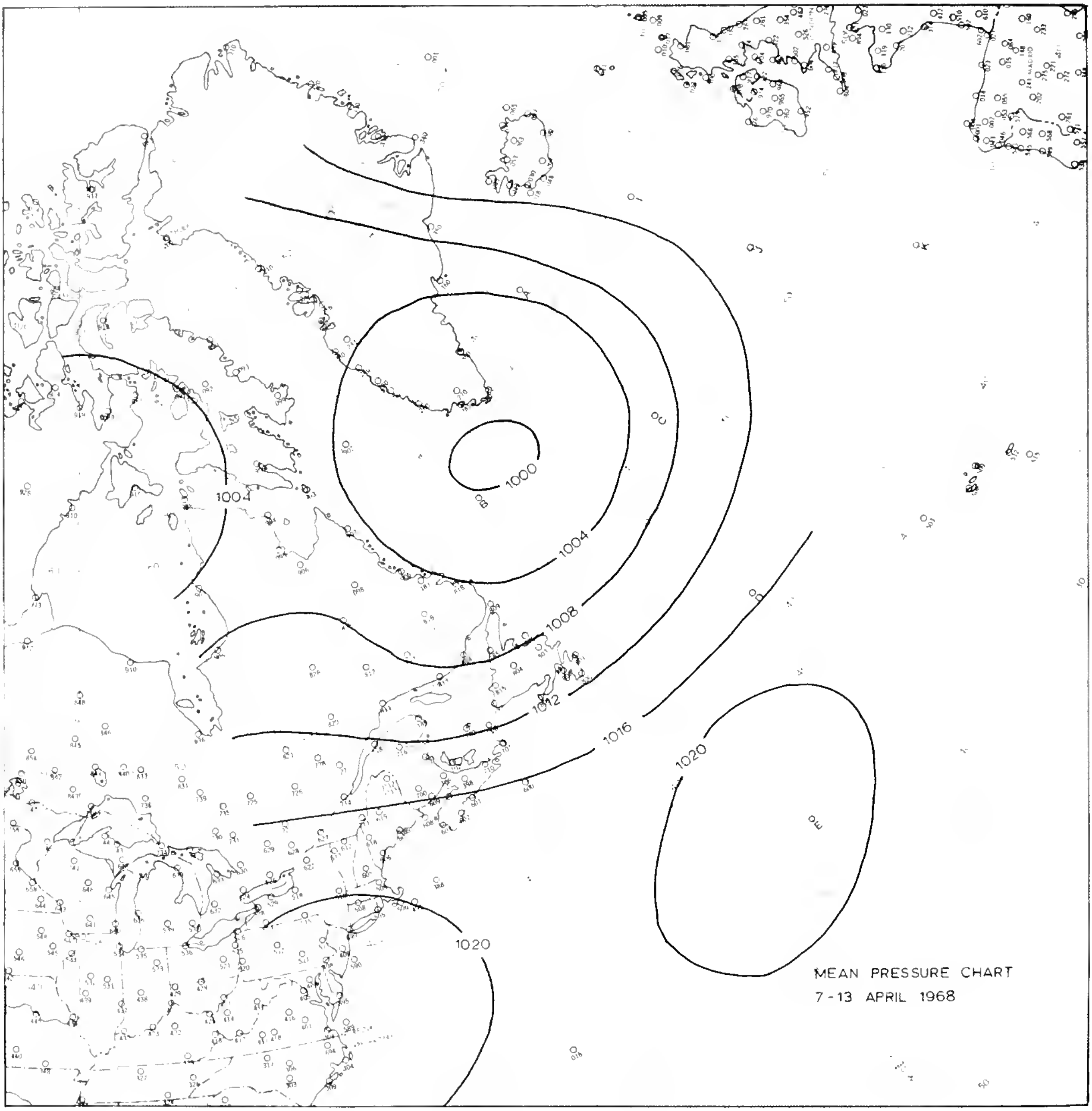


Figure 17.—**Average Weekly Surface Pressure, 7–13 April 1968.**

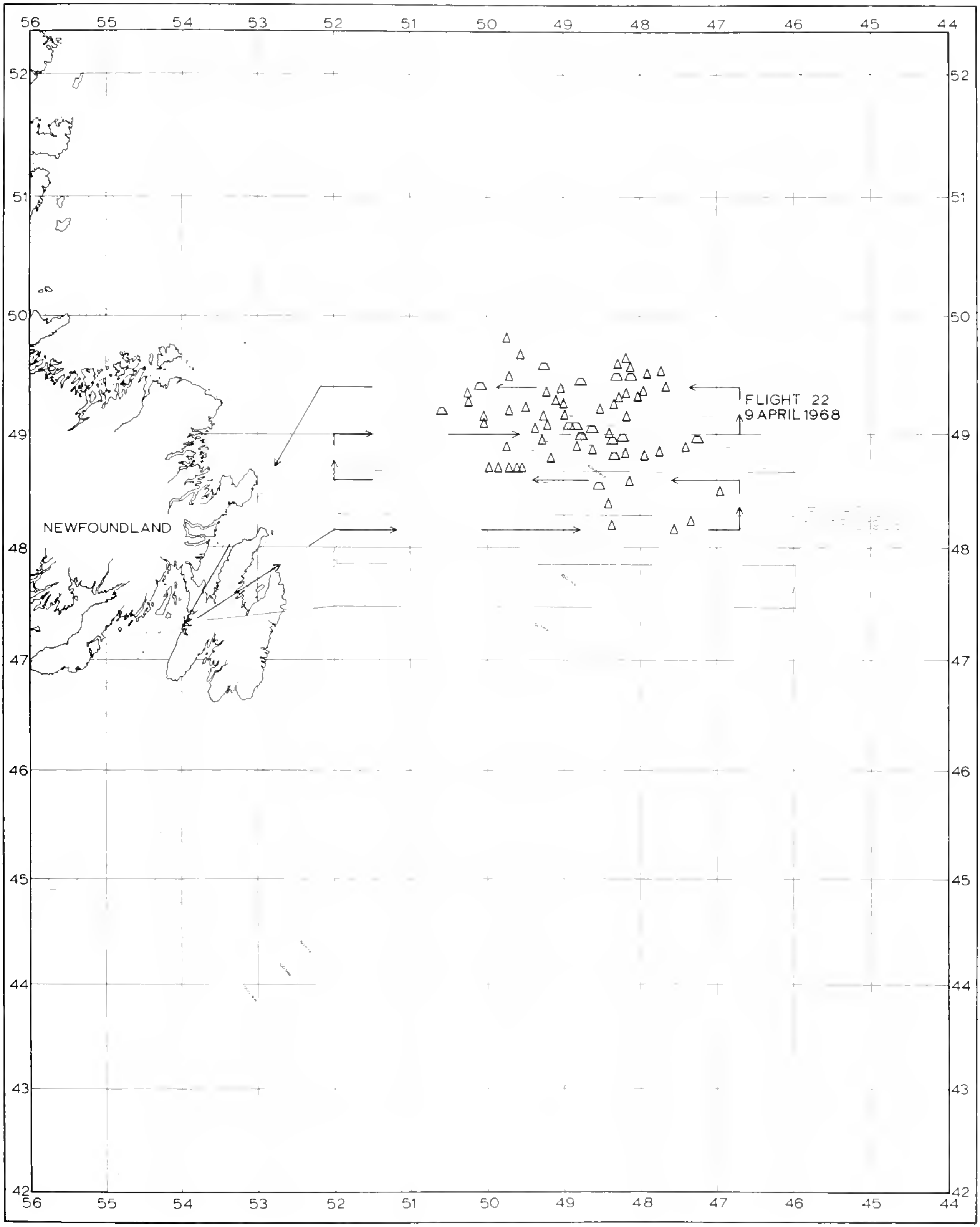


Figure 18.—Ice Conditions, 9–11 April 1968.

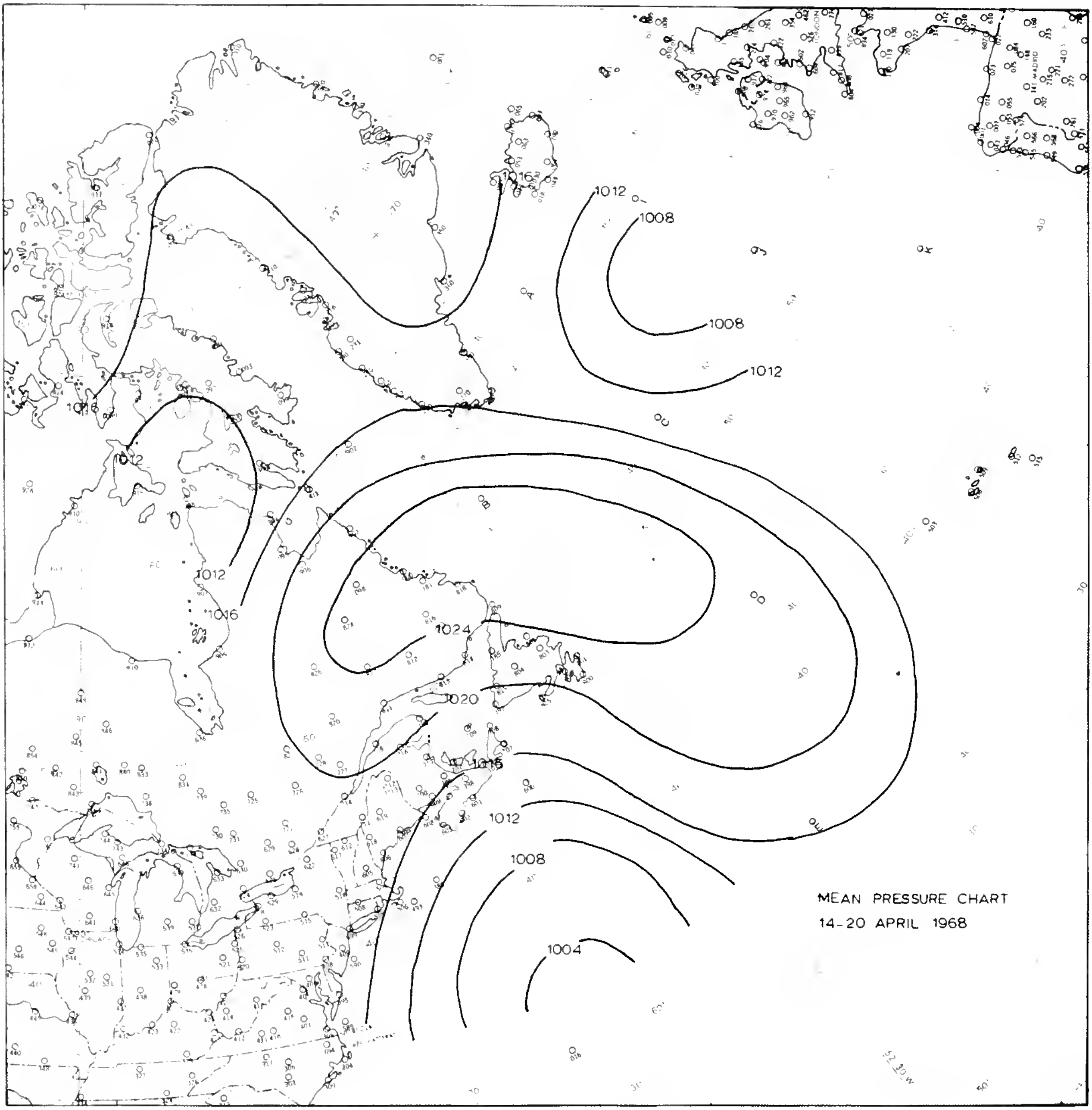


Figure 19.—Average Weekly Surface Pressure, 14–20 April 1968.

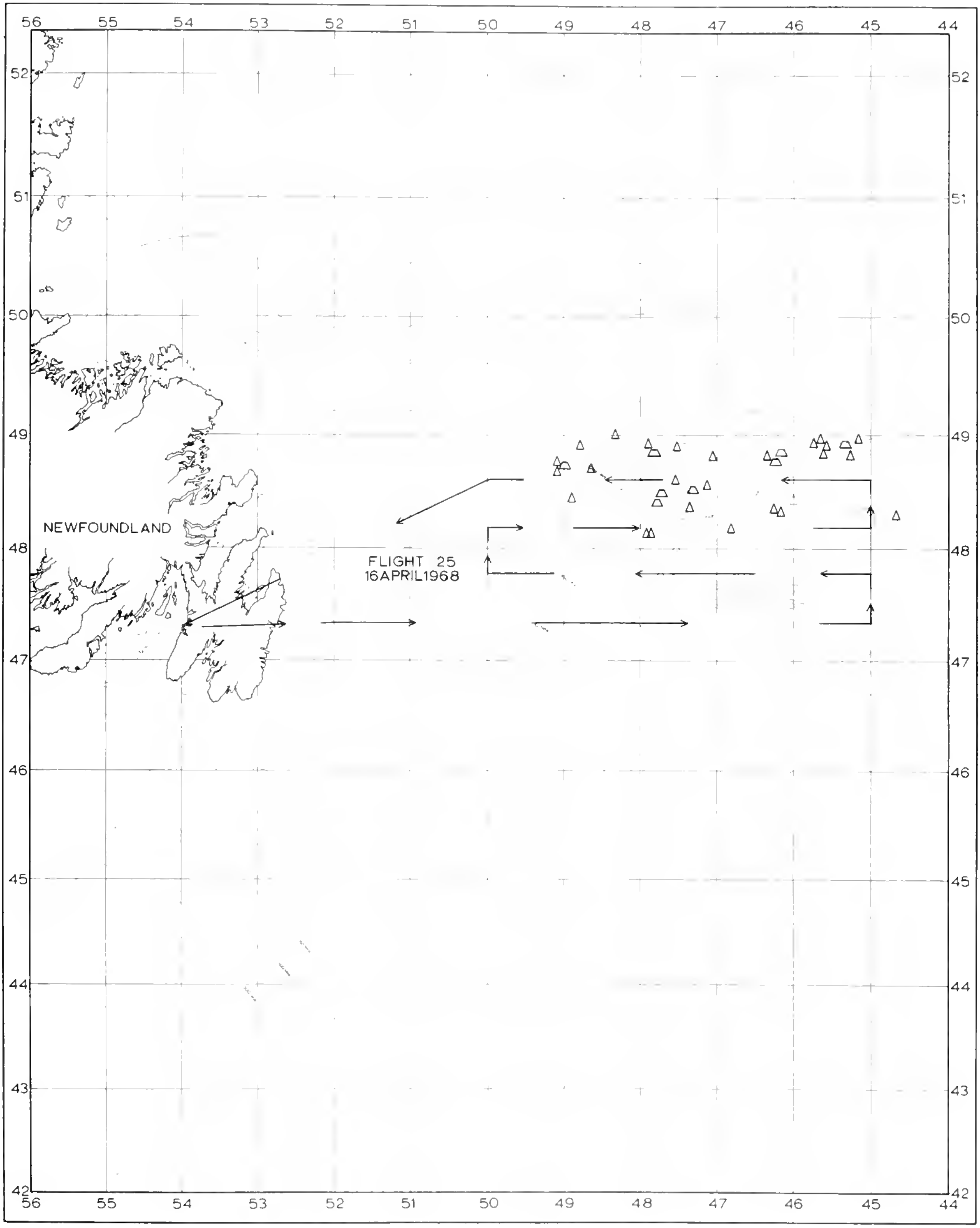


Figure 20.—Ice Conditions, 16–19 April 1968.

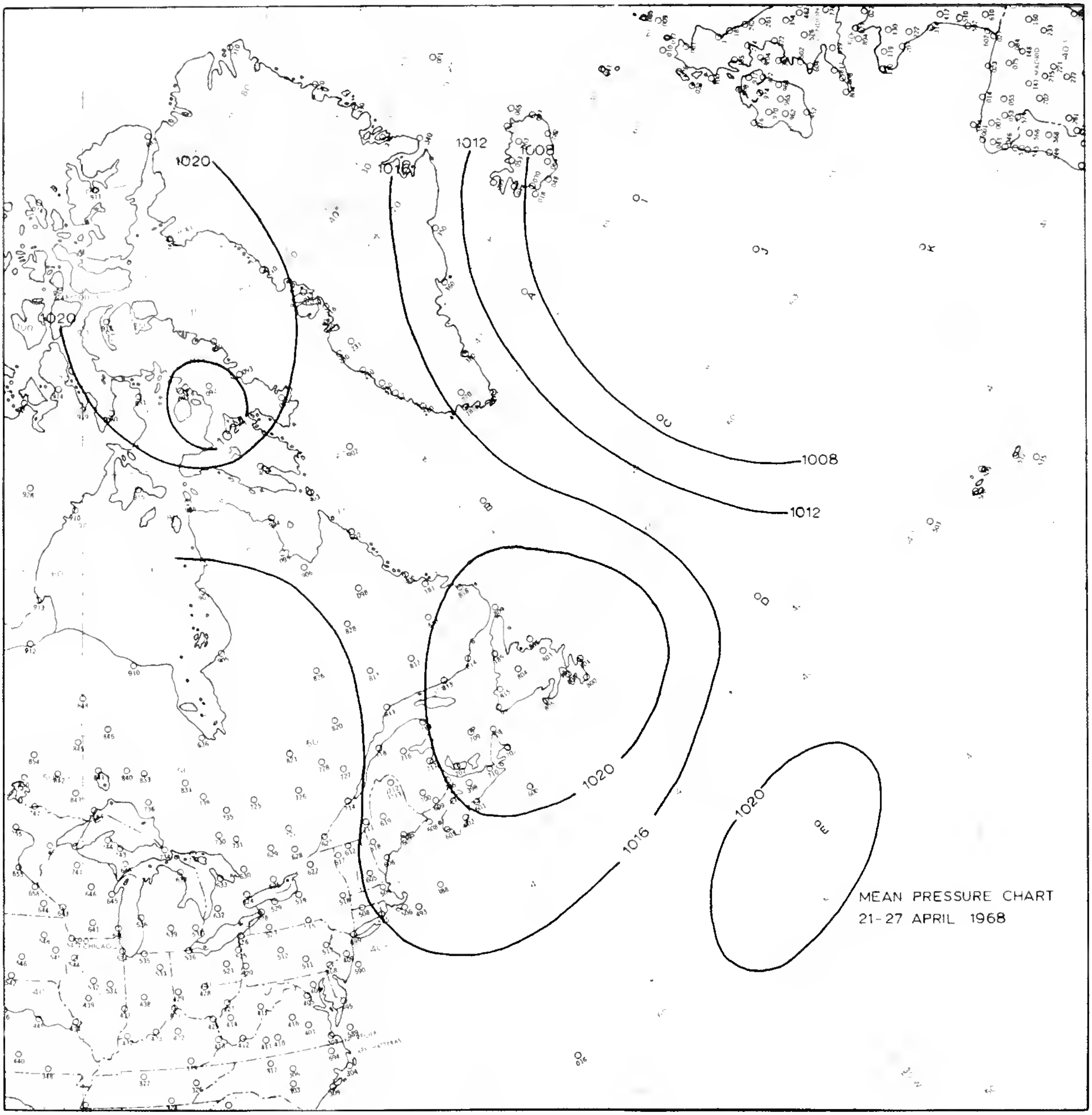


Figure 21.—**Average Weekly Surface Pressure, 21–27 April 1968.**

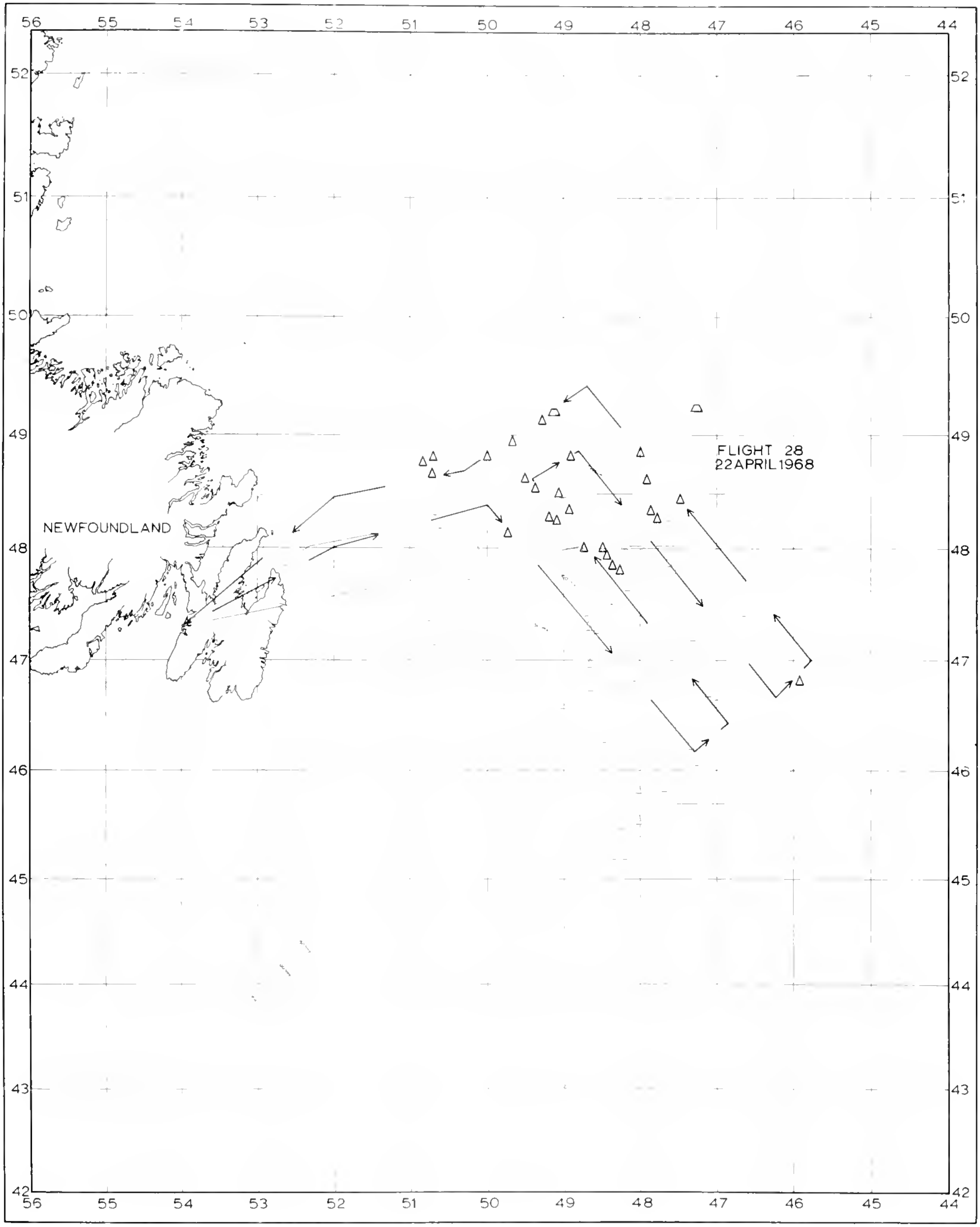


Figure 22.—Ice Conditions, 22–25 April 1968.

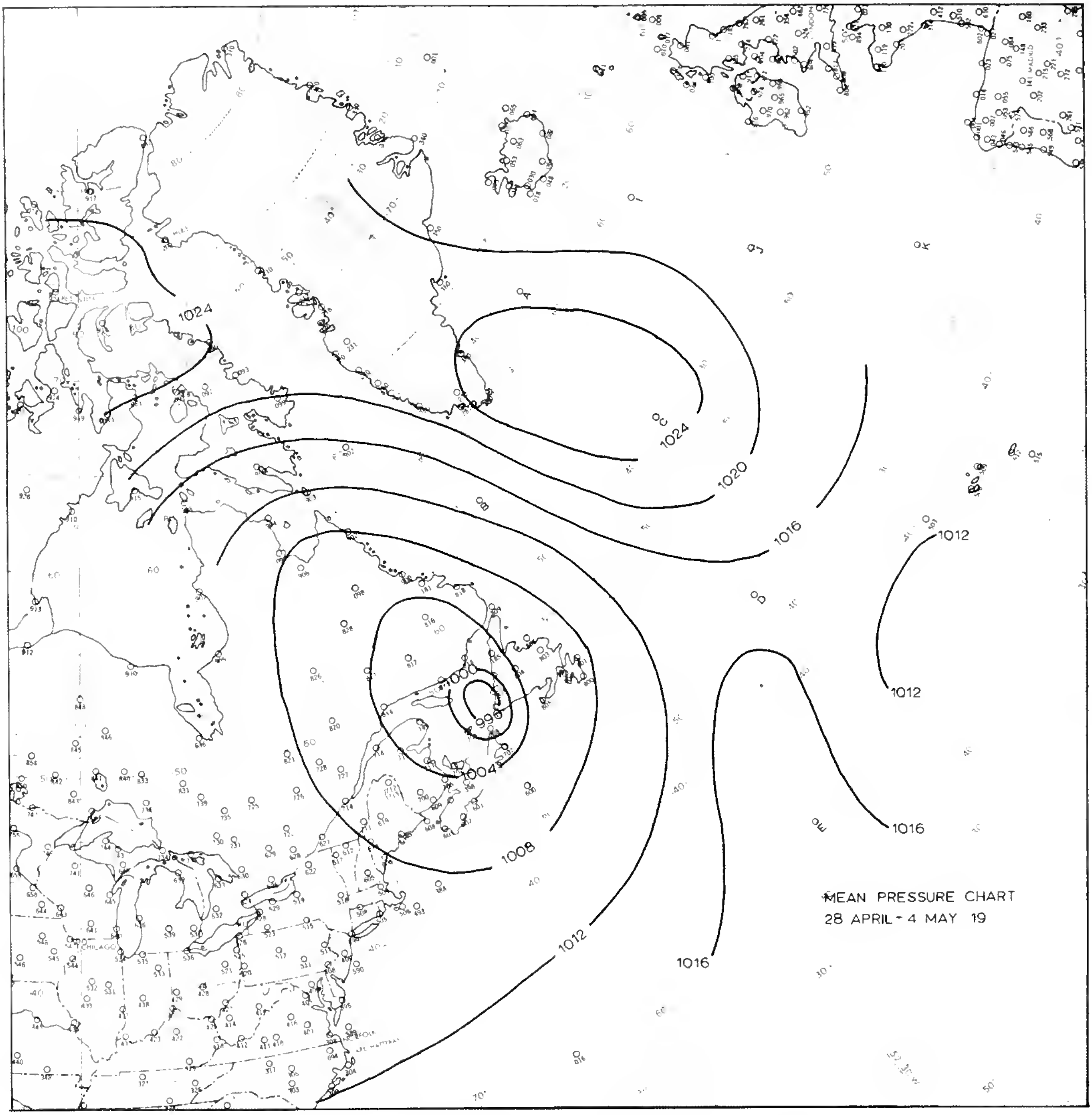


Figure 23.—Average Weekly Surface Pressure, 28 April–4 May 1968.

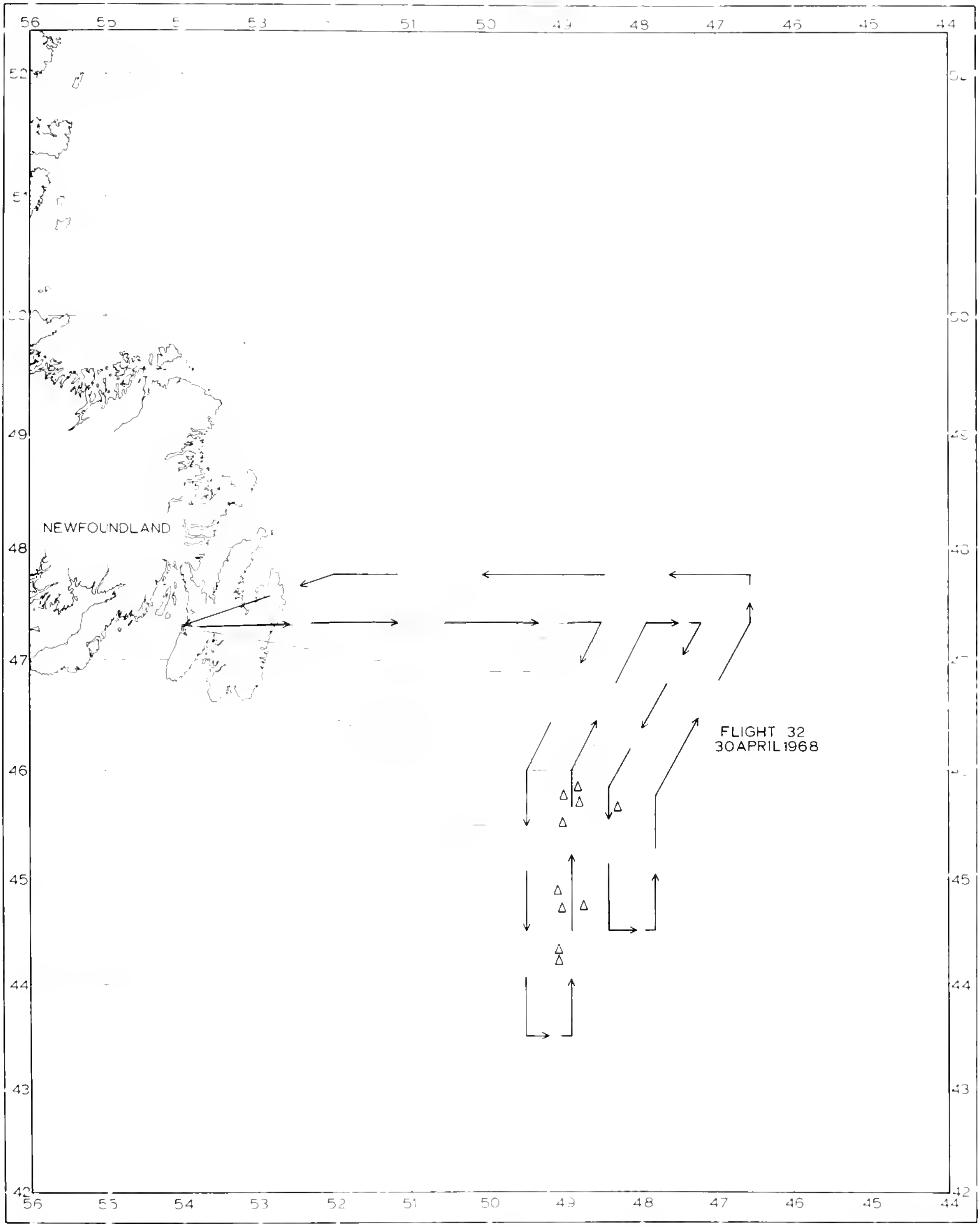


Figure 24.—Ice Conditions, 30 April–1 May 1968.

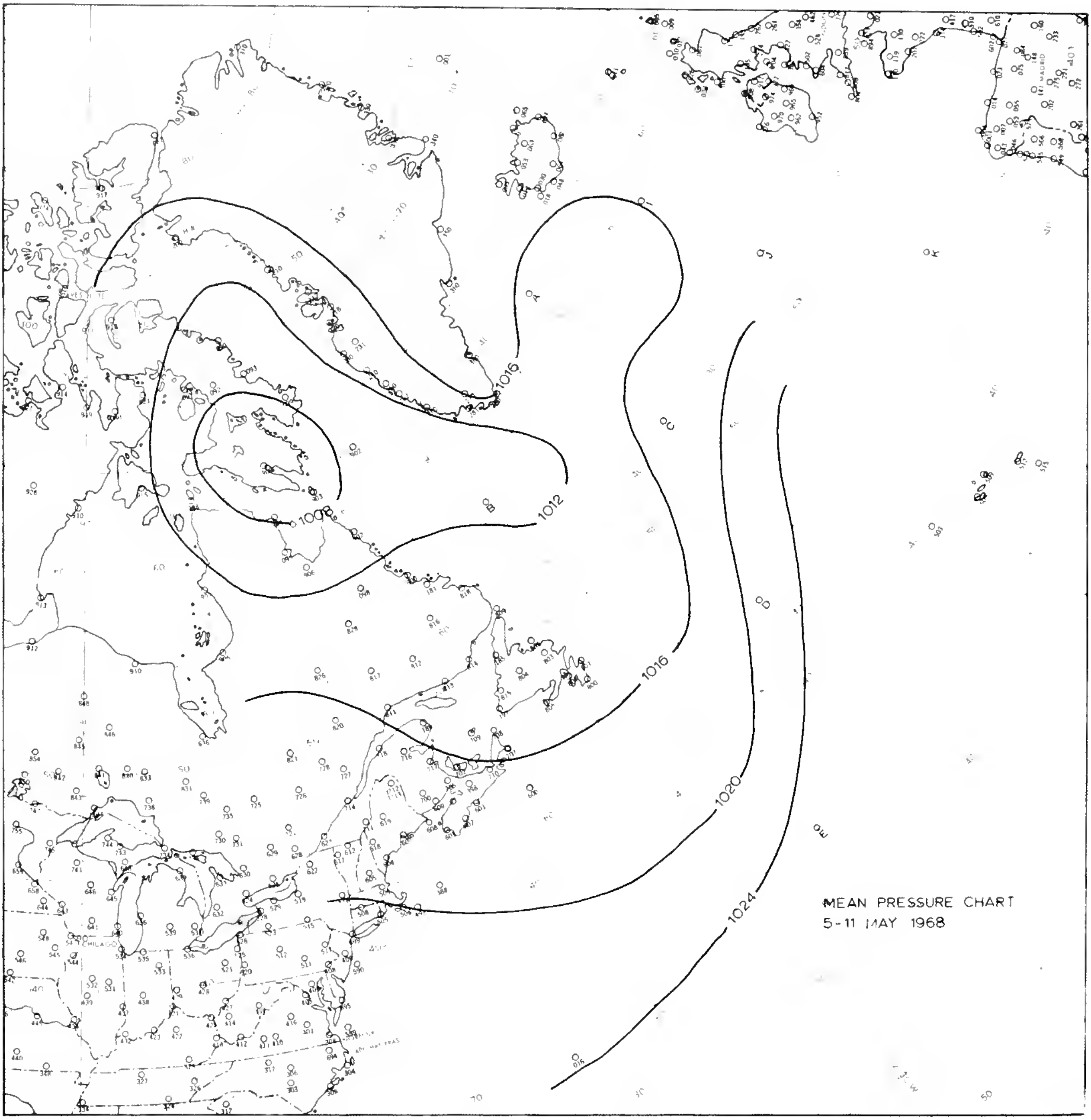


Figure No. 25.—Average Weekly Surface Pressure, 5–11 May 1968.

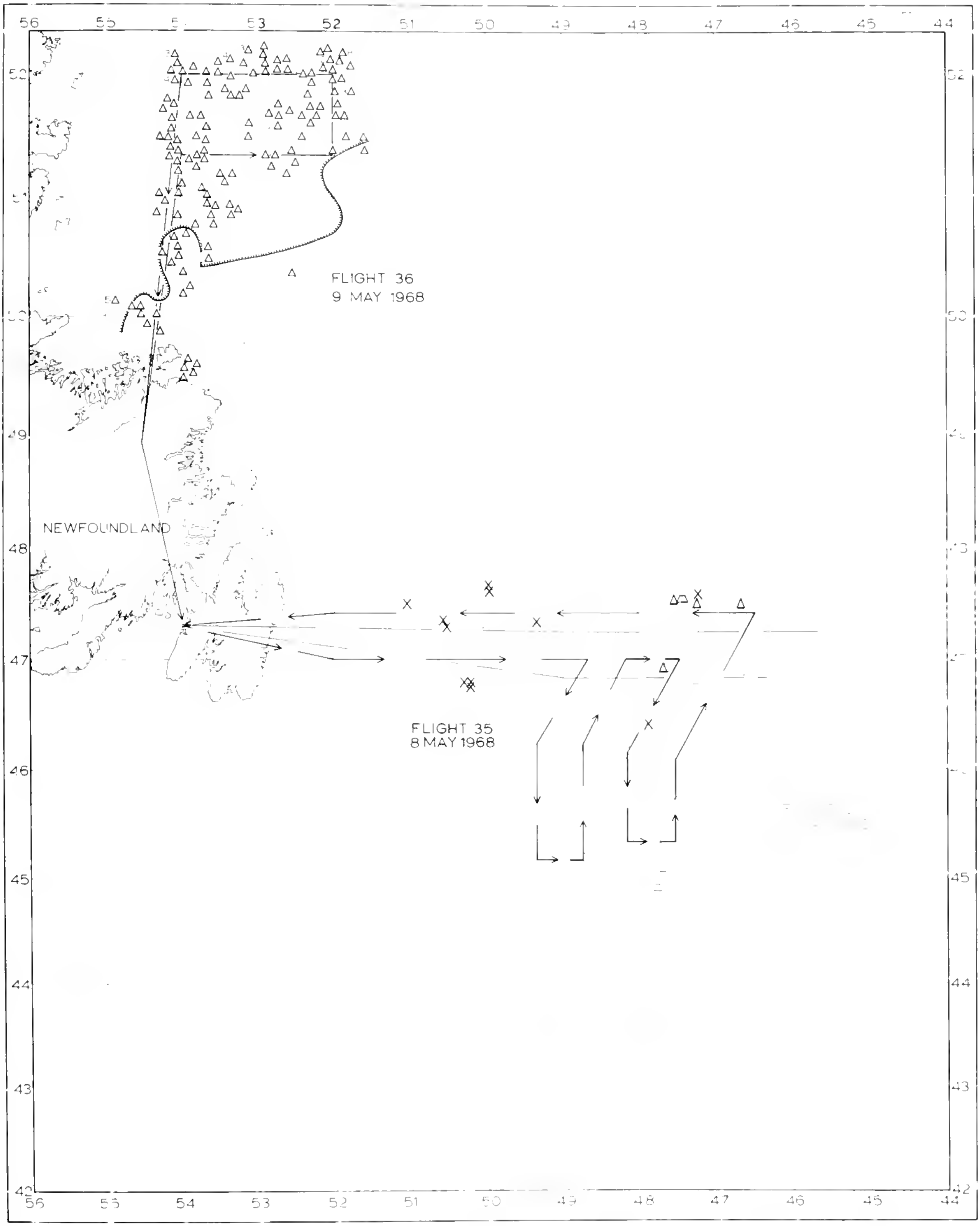


Figure 26.—Ice Conditions, 8–10 May 1968.

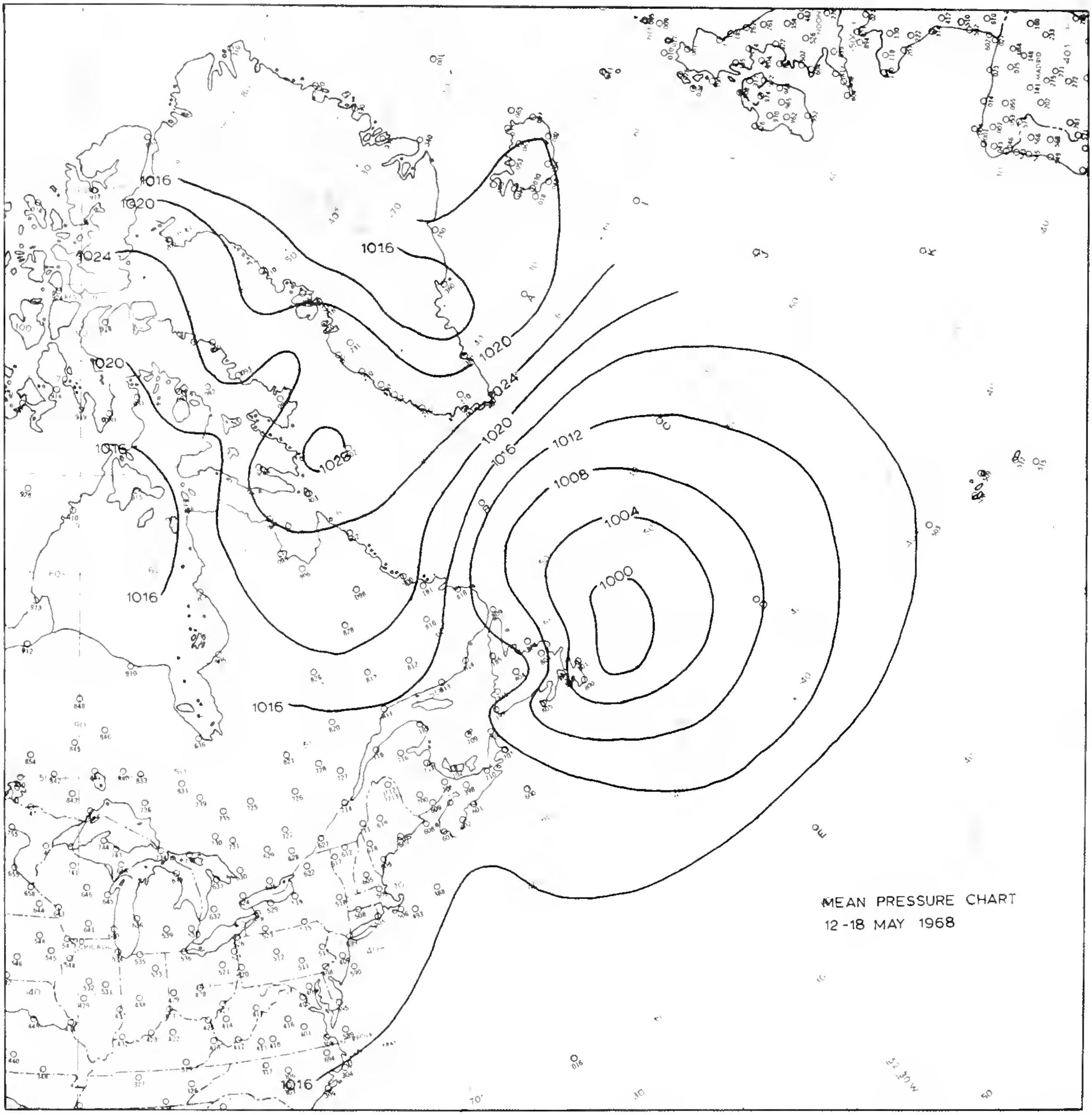


Figure 27.—Average Weekly Surface Pressure, 12–18 May 1968.

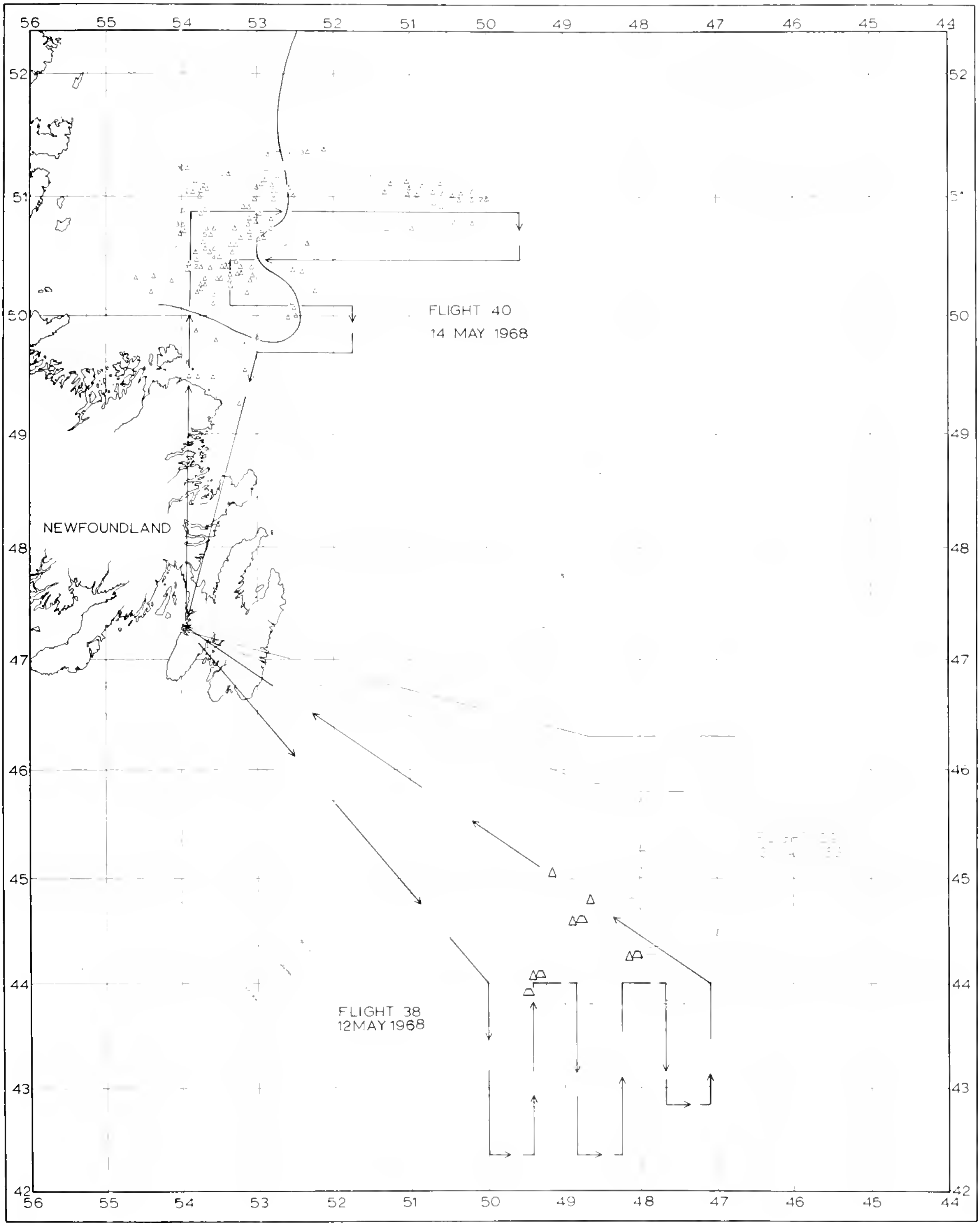


Figure 28.—Ice Conditions, 12–14 May 1968.

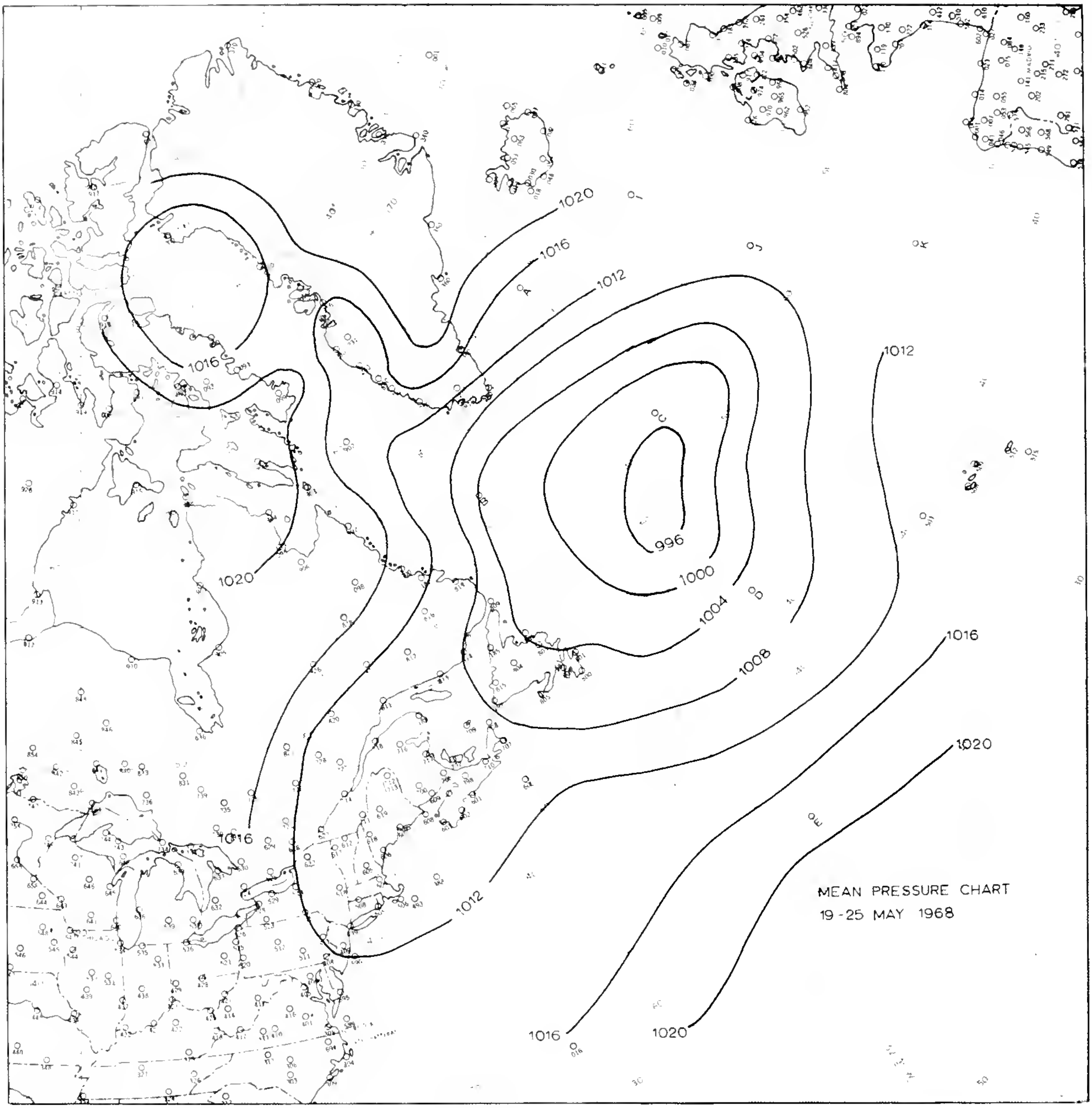


Figure 29.—Average Weekly Surface Pressure Chart, 19–25 May 1968.

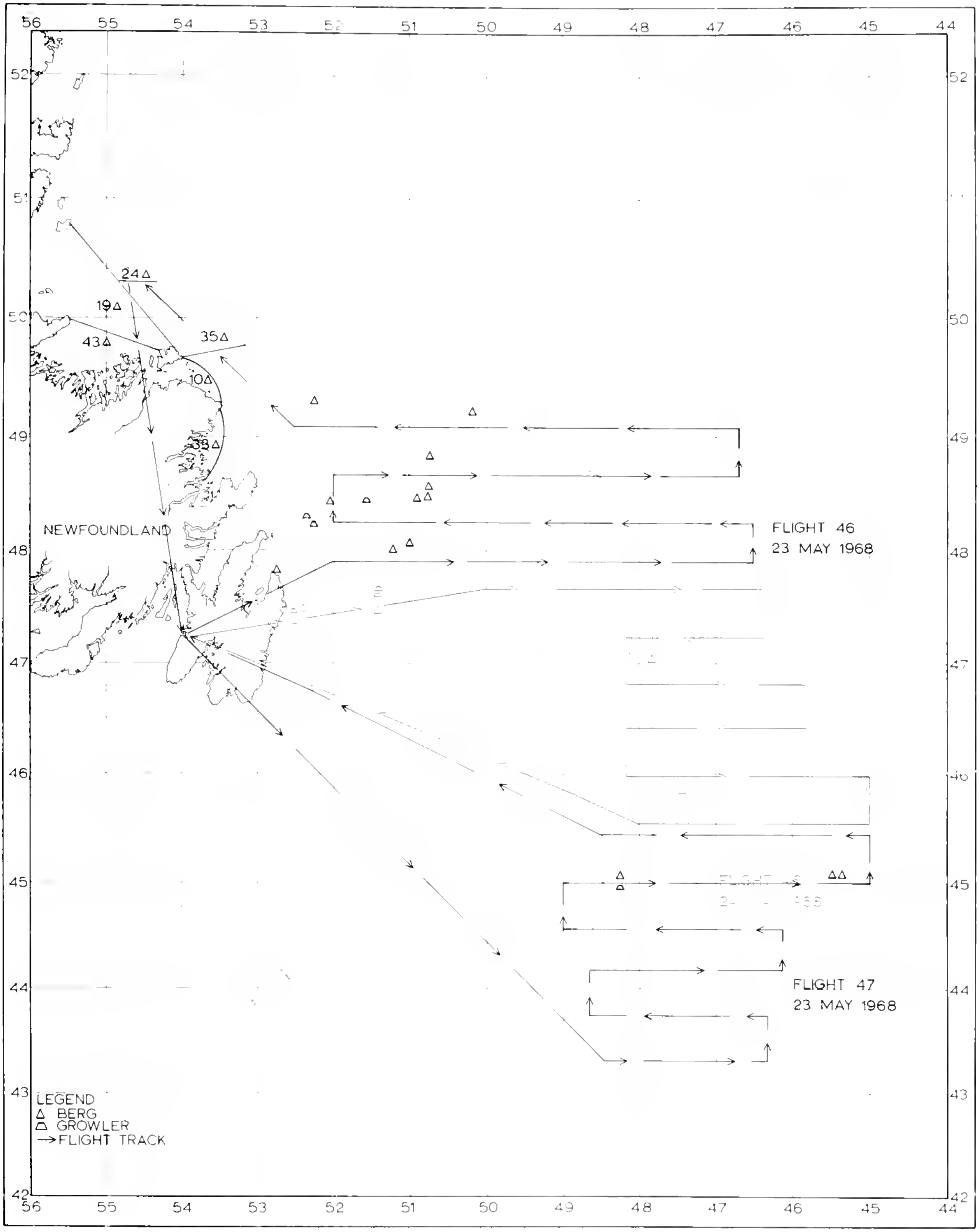


Figure 30.—Ice Conditions, 23 and 24 May 1968.

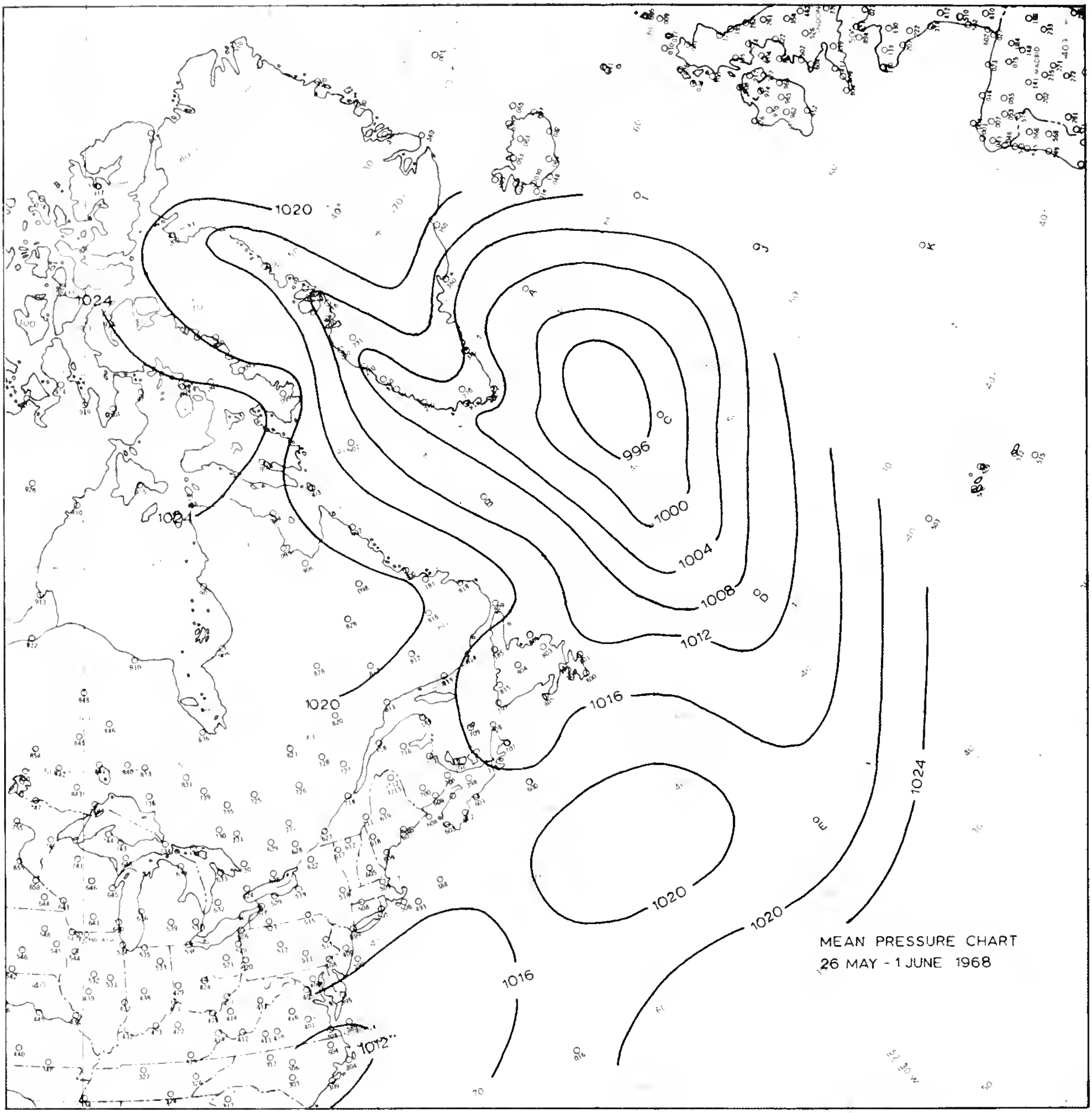


Figure 31.—Average Weekly Surface Pressure, 26 May–1 June 1968.

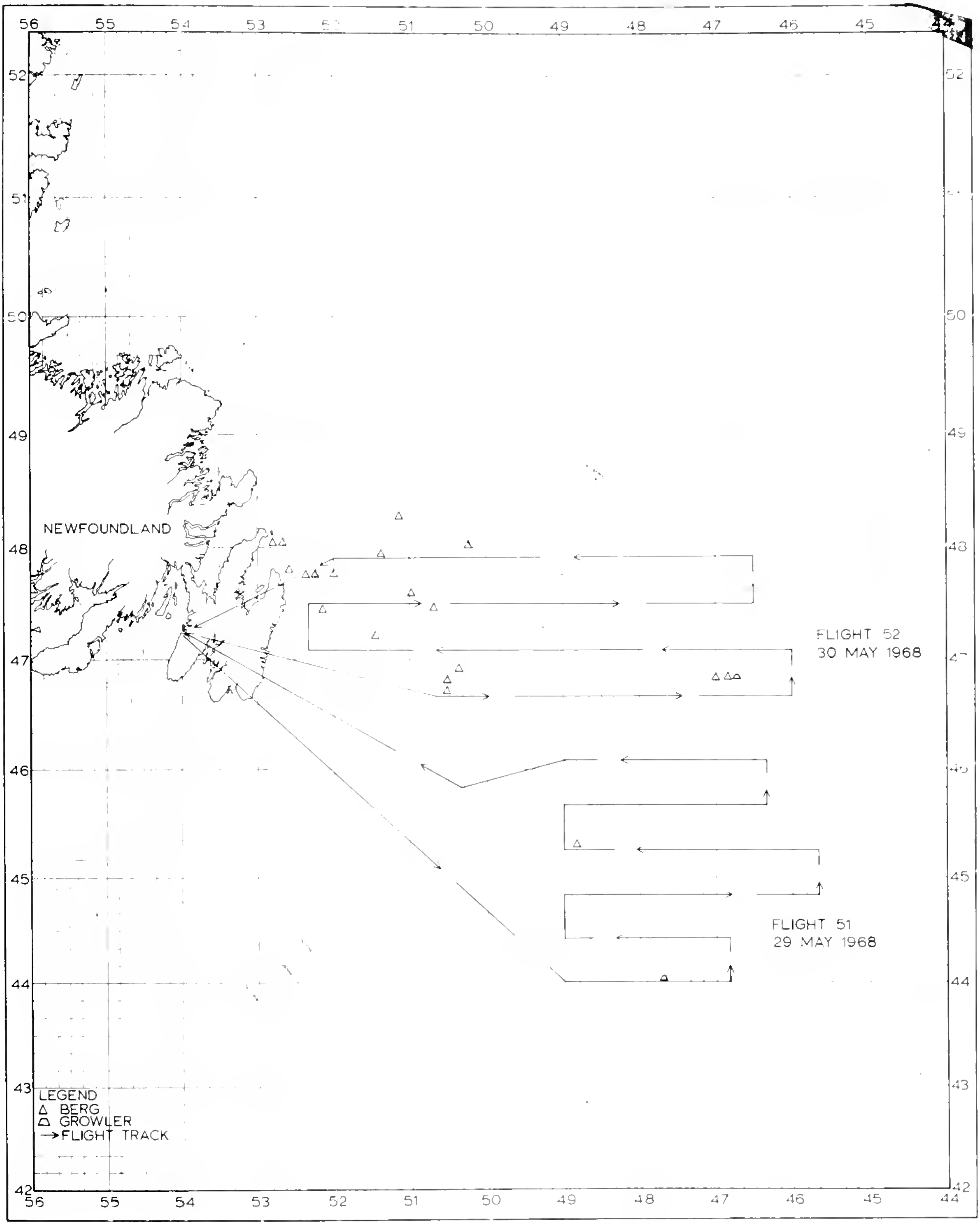


Figure 32.—Ice Conditions, 29–30 May 1968.

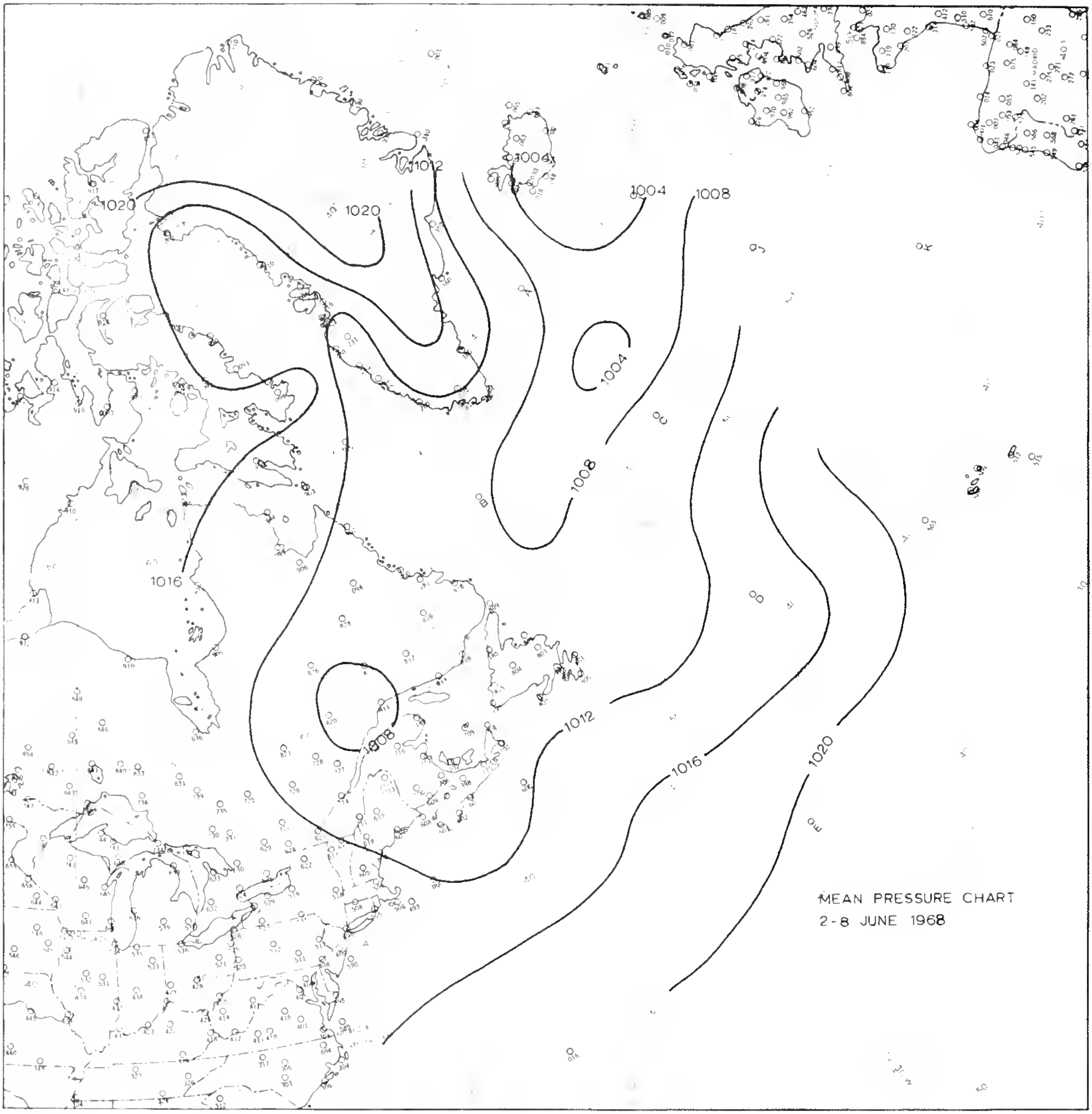


Figure 33.—Average Weekly Surface Pressure, 2–8 June 1968.

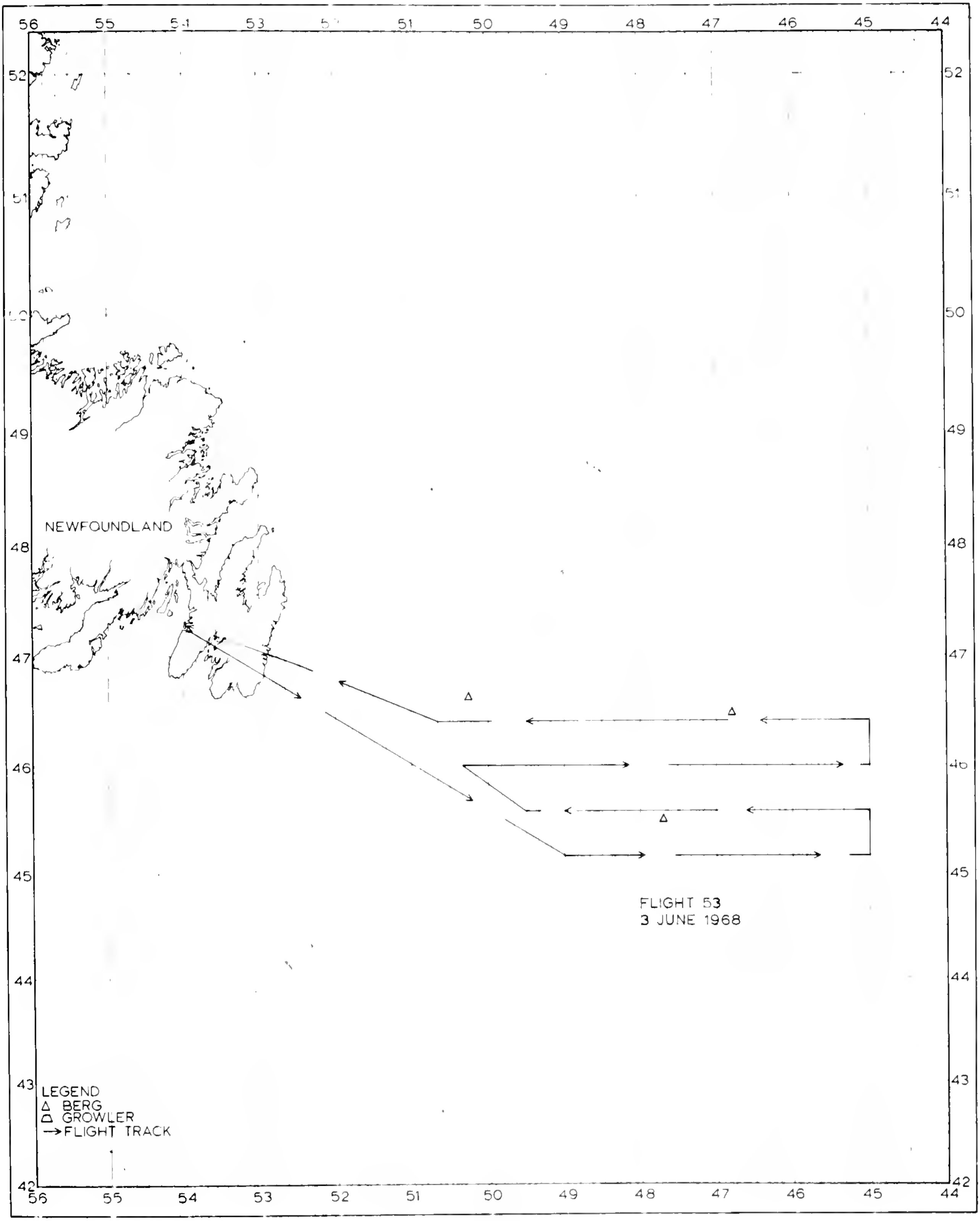


Figure 34.—Ice Conditions, 3 June 1968.

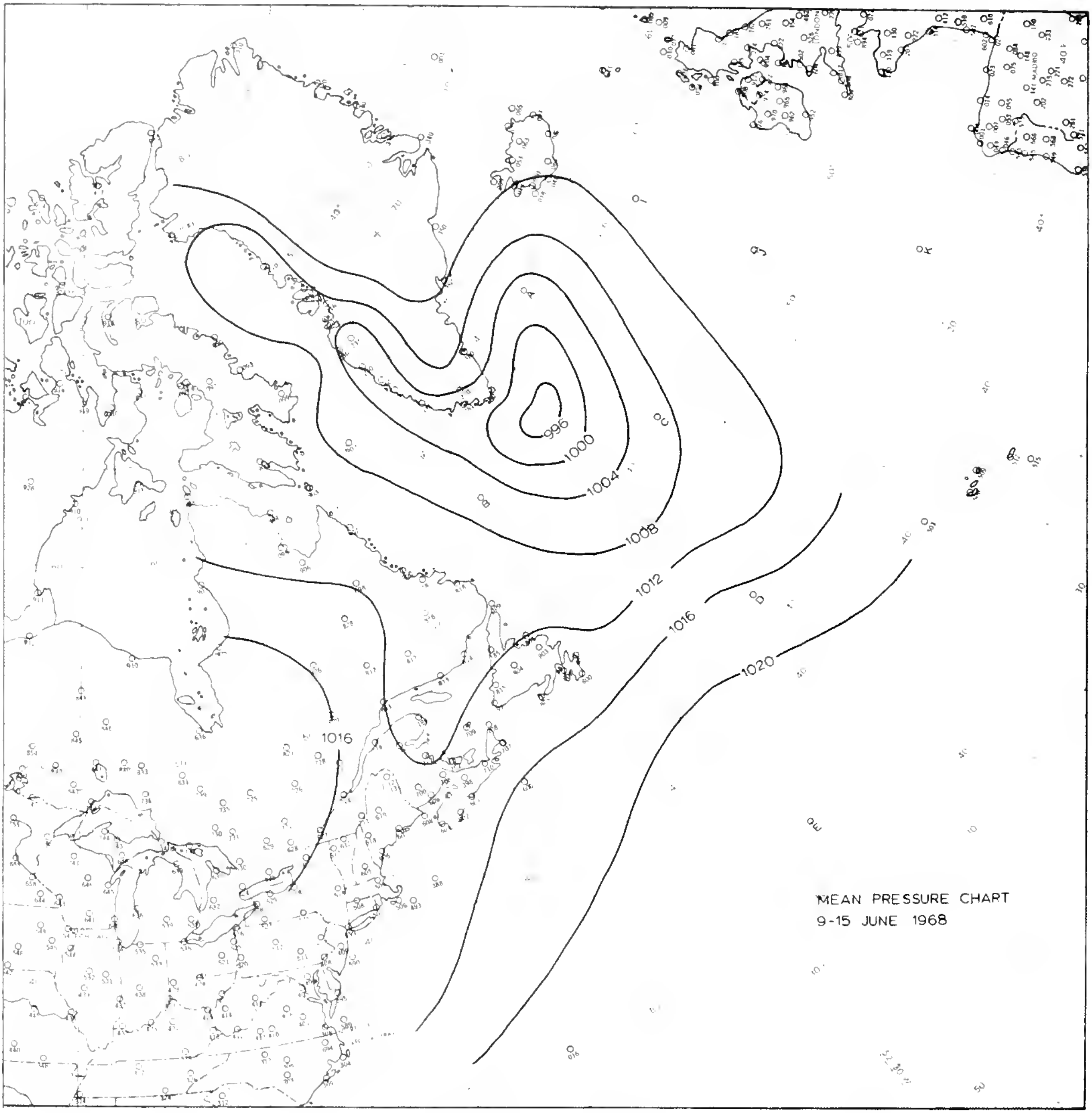


Figure 35.—Average Weekly Surfoce Pressure, 9–15 June 1968.

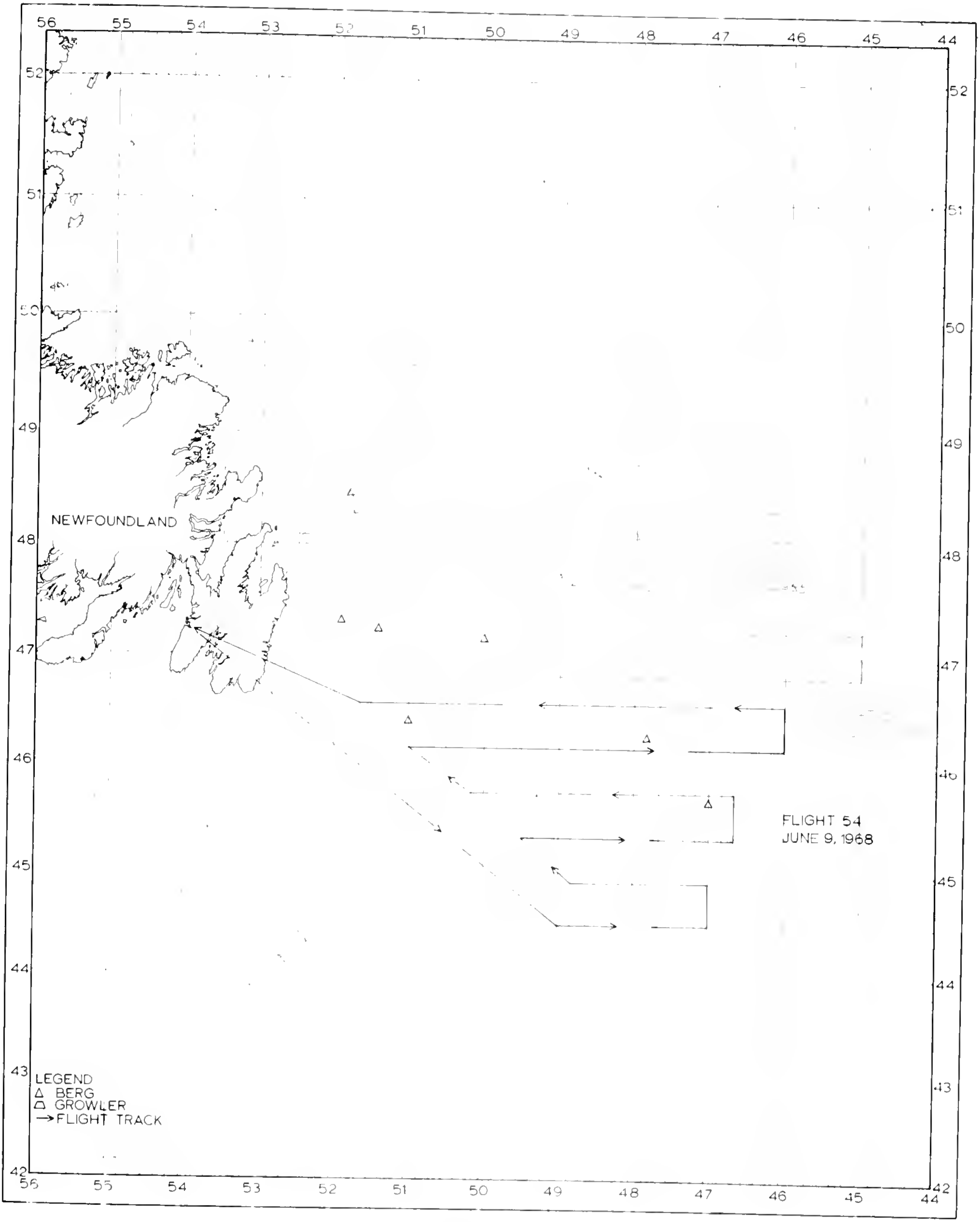


Figure 36.—Ice Conditions, 9–11 June 1968.

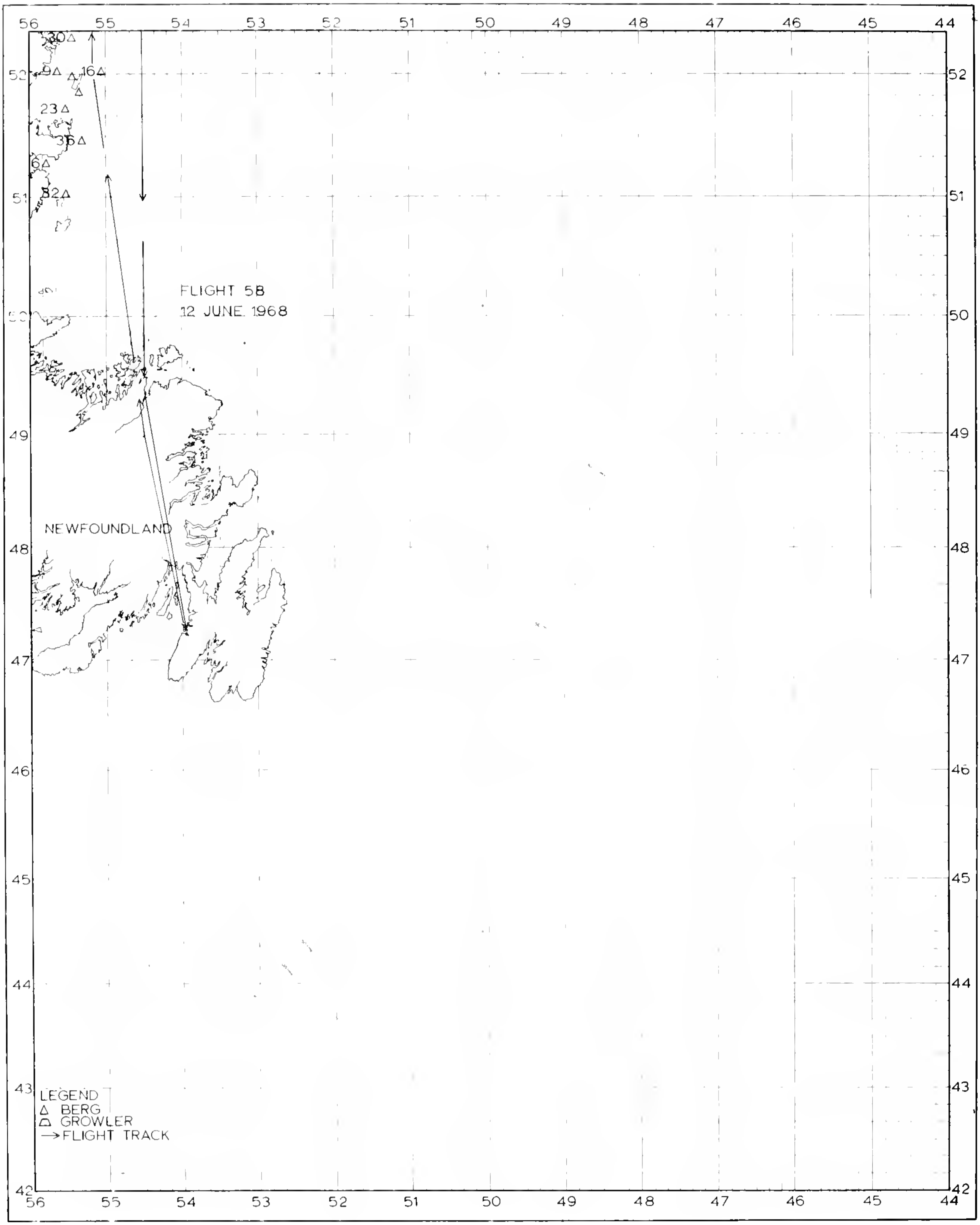


Figure 37.—**Ice Conditions to Cape Chidley 12 June 1968.**

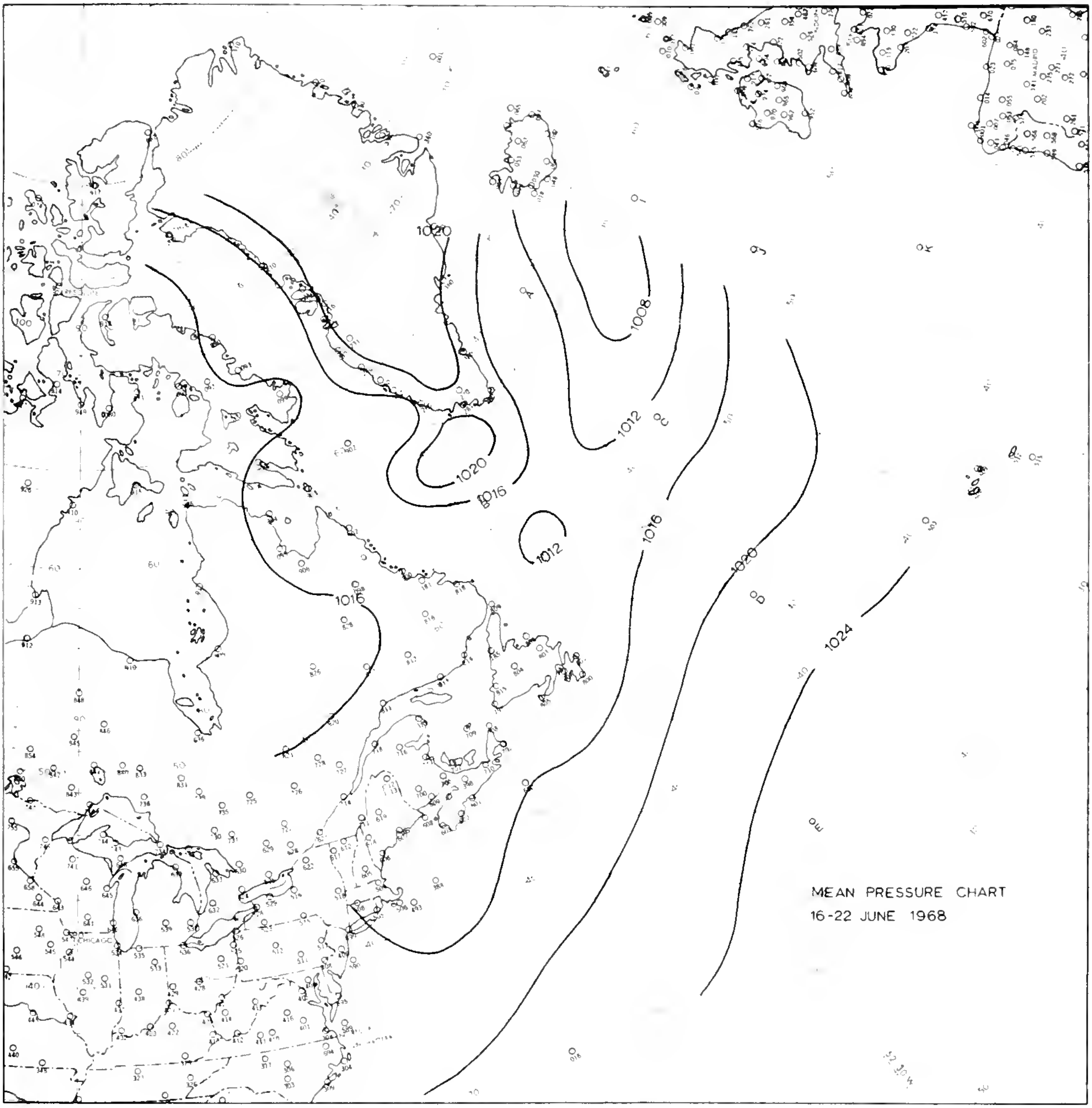


Figure 38.—Average Weekly Surface Pressure, 16–22 June 1968.

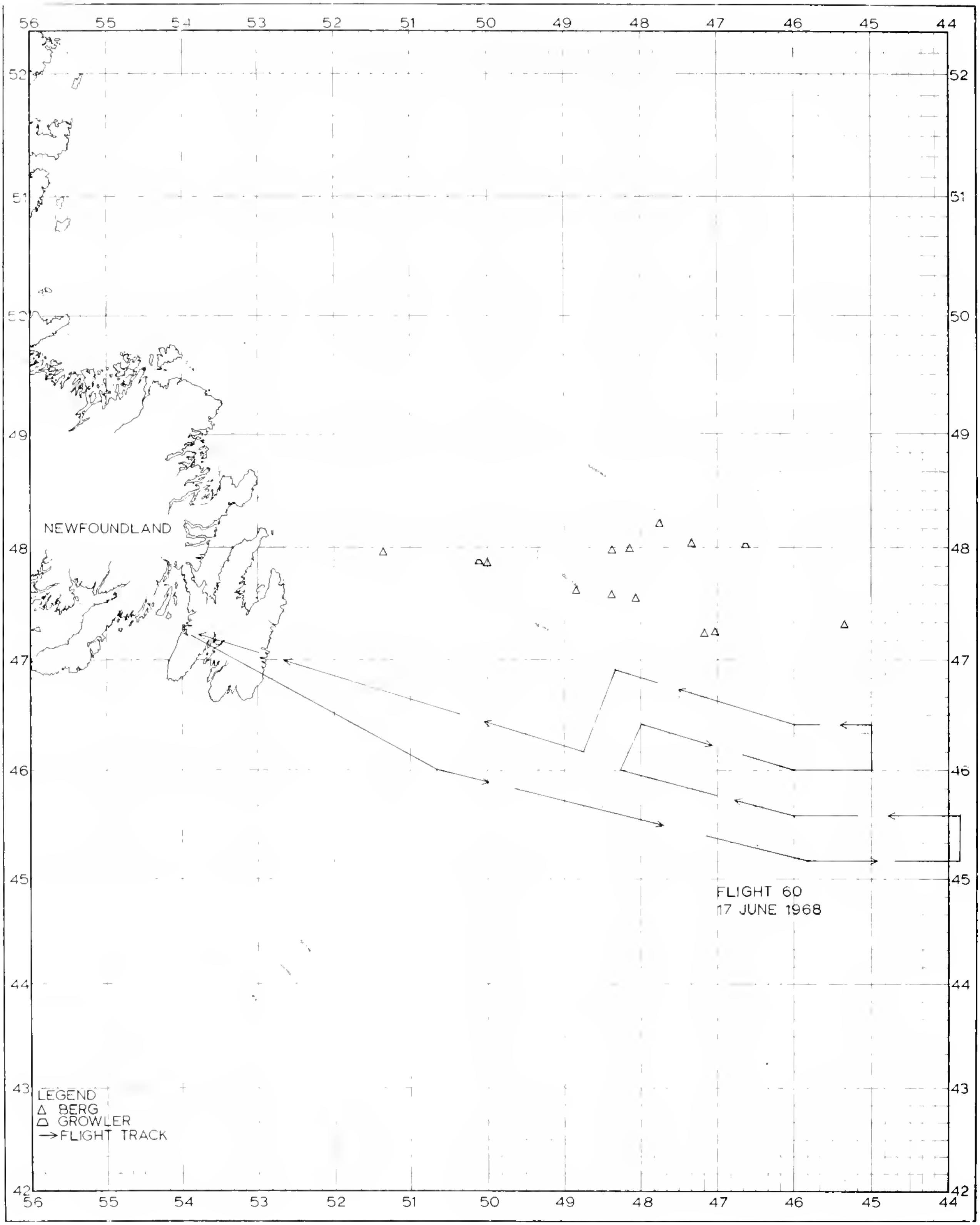


Figure 39.—Ice Conditions, 17 June 1968.

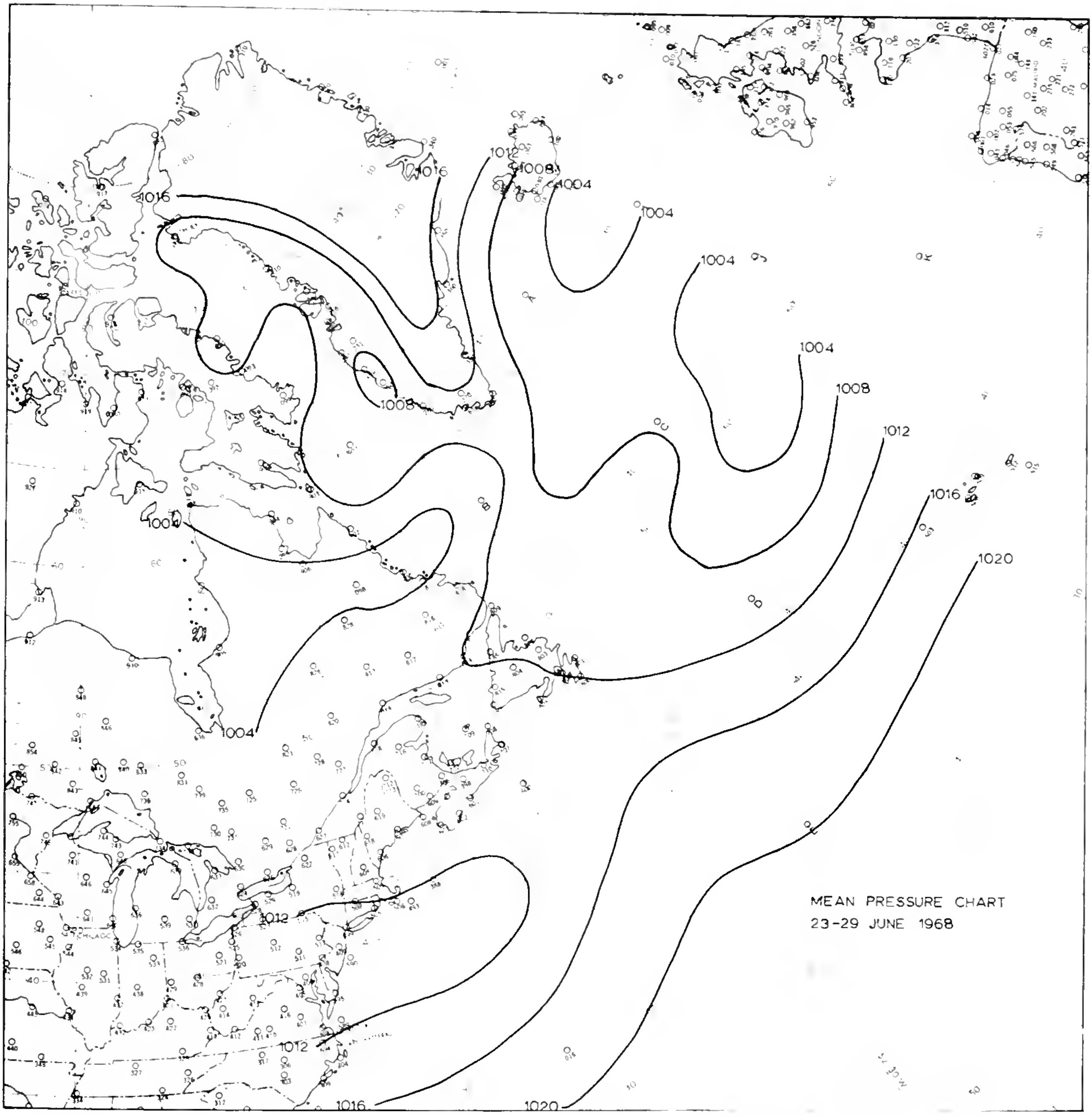


Figure 40.—Average Weekly Surface Pressure, 23–29 June 1968.

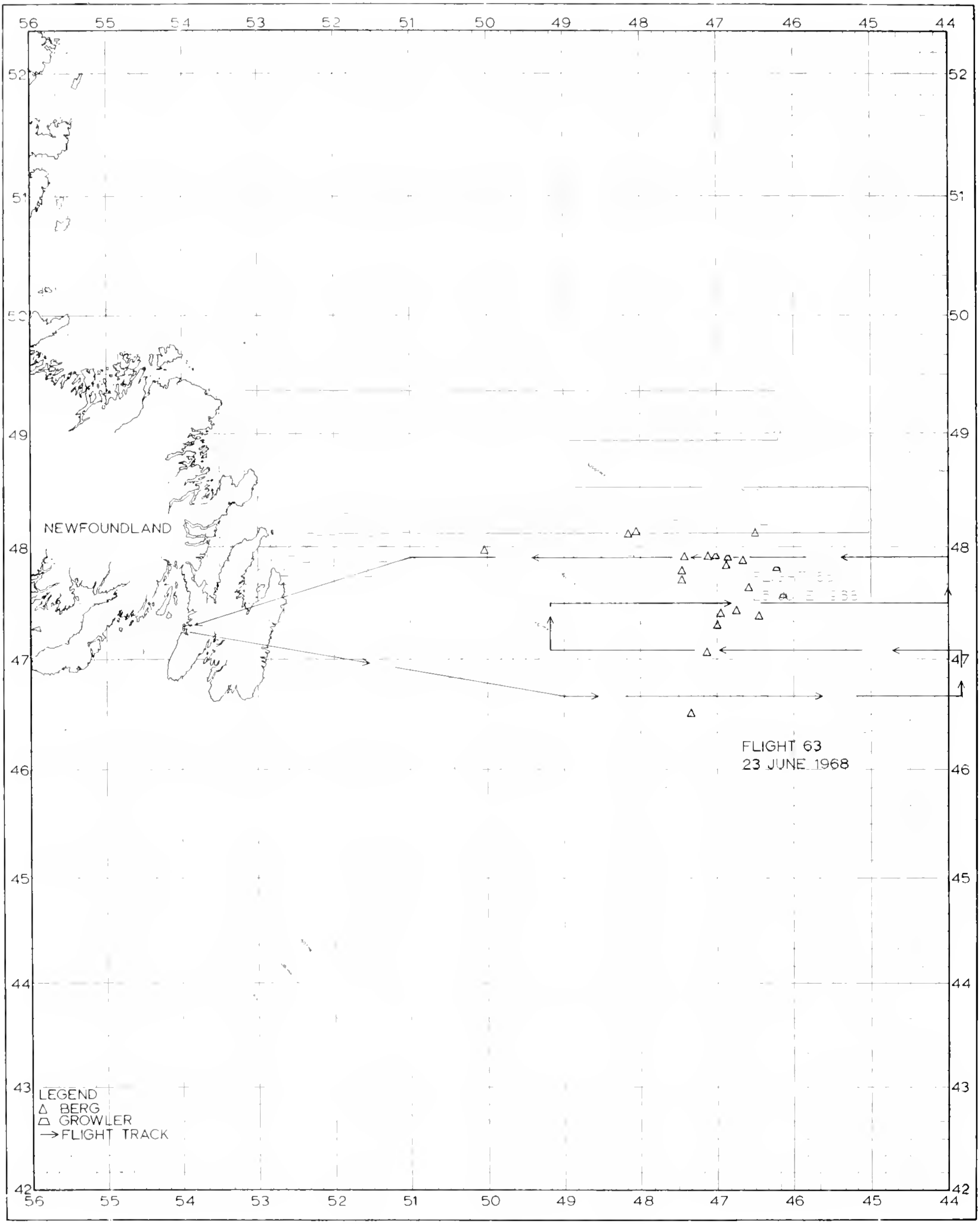


Figure 41.—Ice Conditions, 23–25 June 1968.

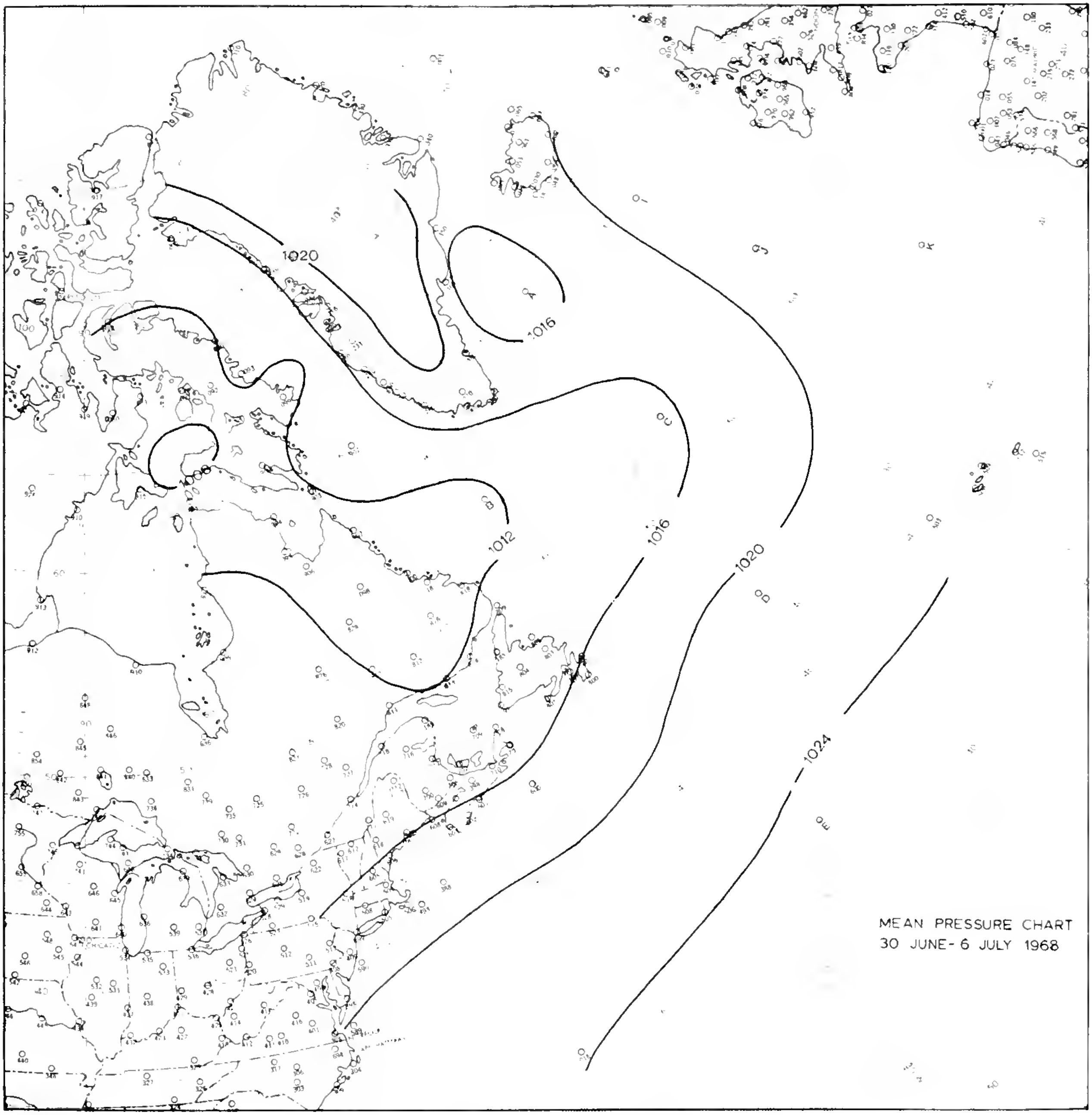


Figure 42.—Average Weekly Surface Pressure, 30 June–6 July 1968.

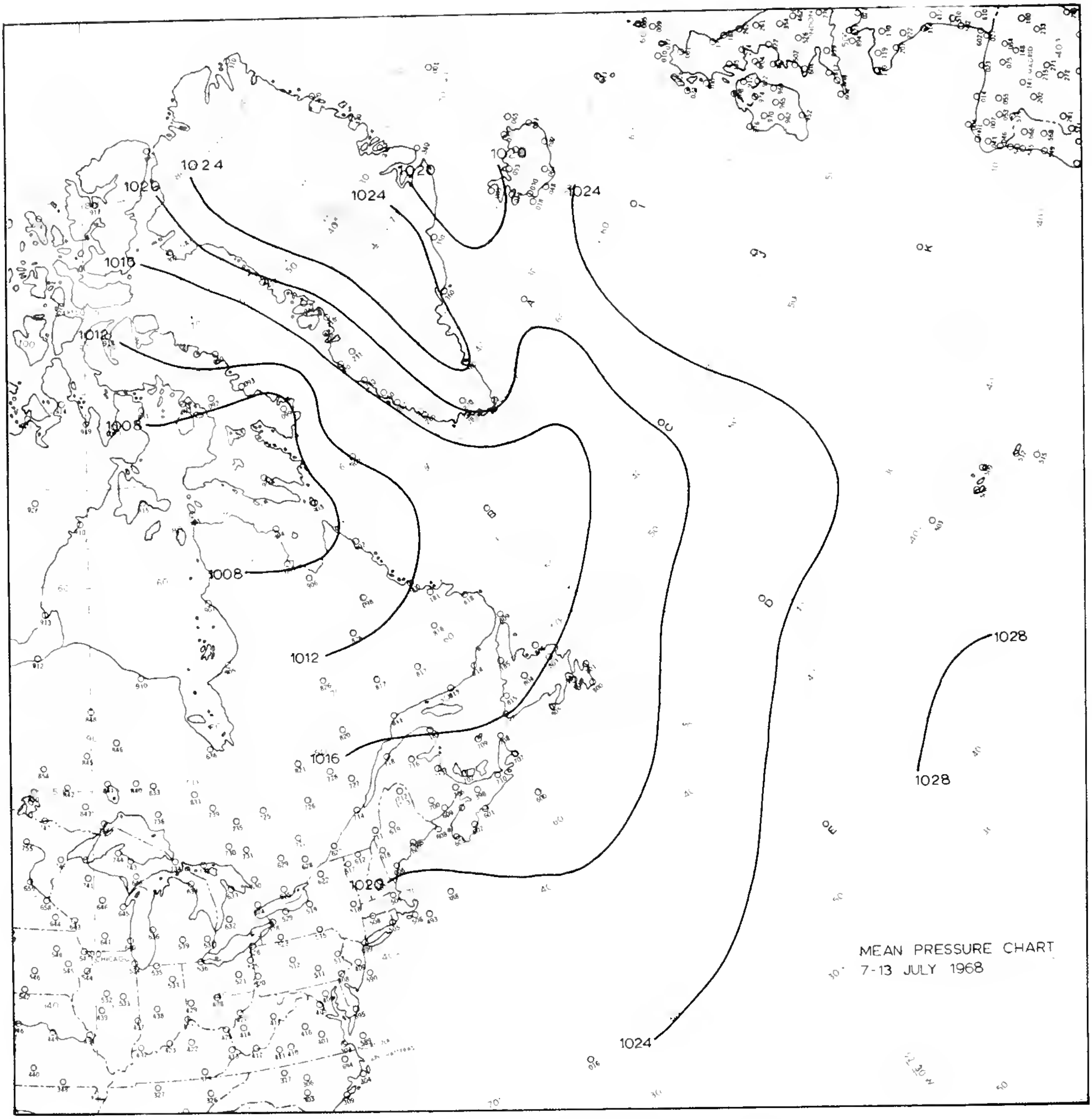


Figure 43.—Average Weekly Surface Pressure, 7–13 July 1968.

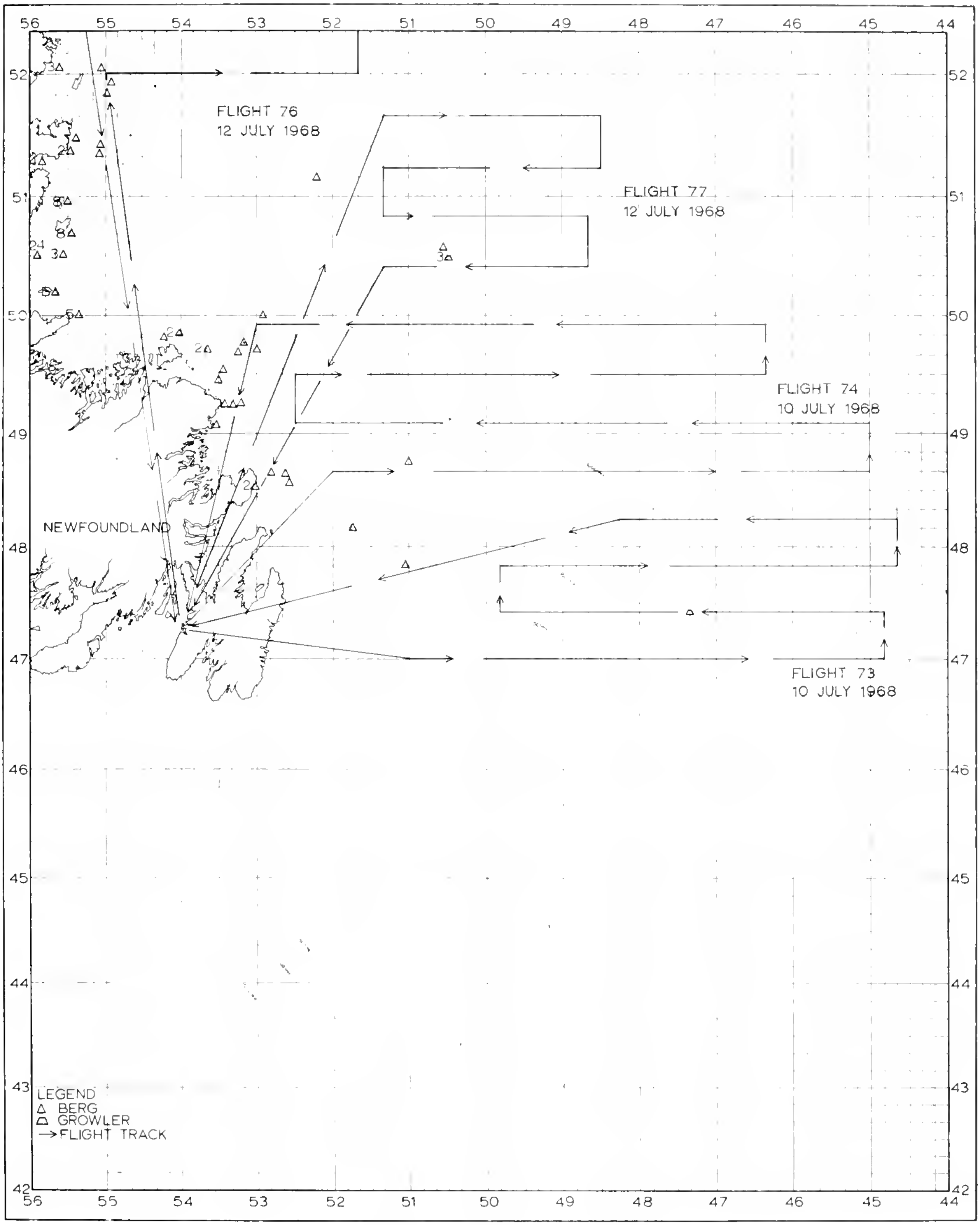


Figure 44.—Ice Conditions, 10–12 July 1968.

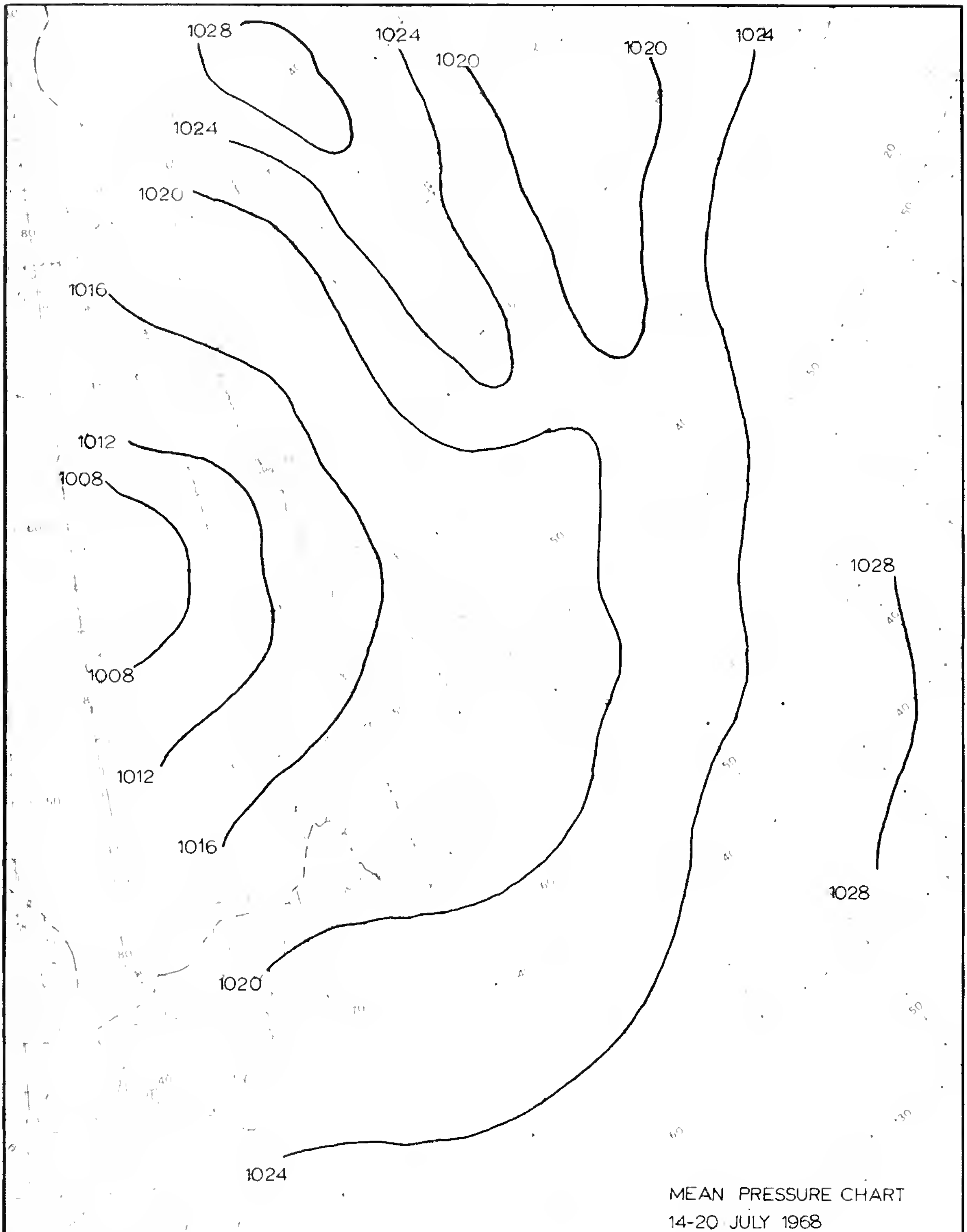


Figure 45.—Average Weekly Surface Pressure, 14–20 July 1968.

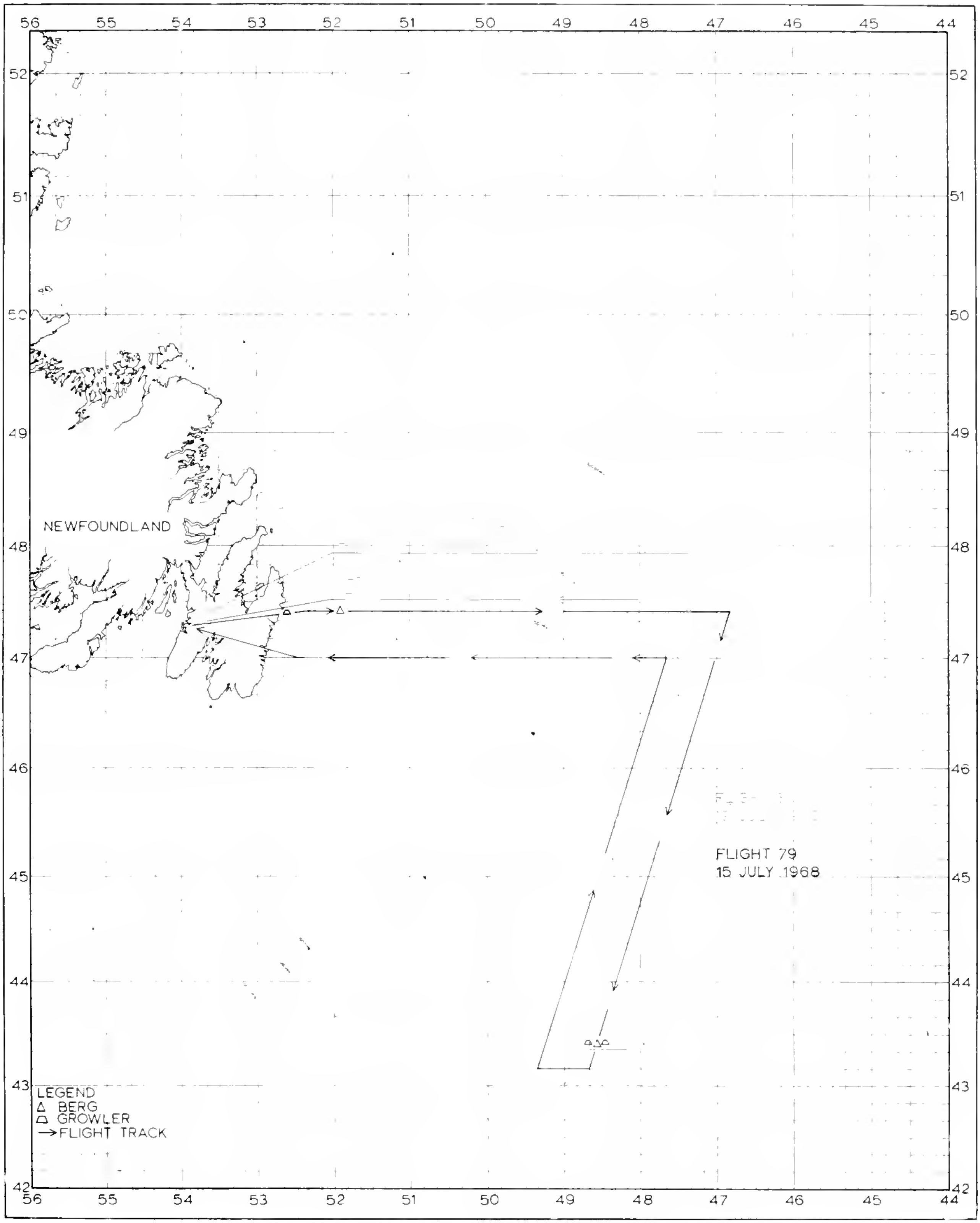
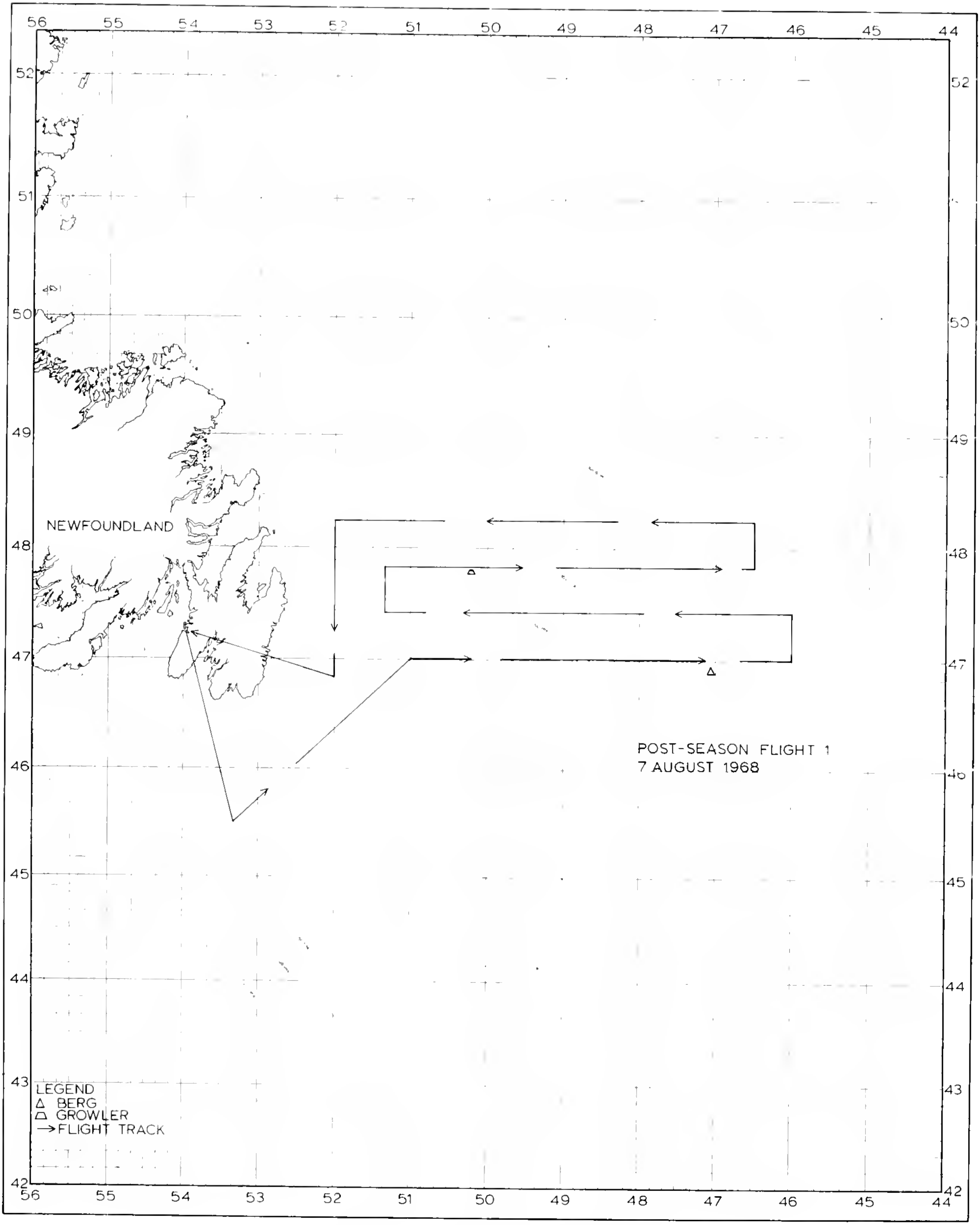


Figure 46.—Ice Conditions, 15–19 July 1968.



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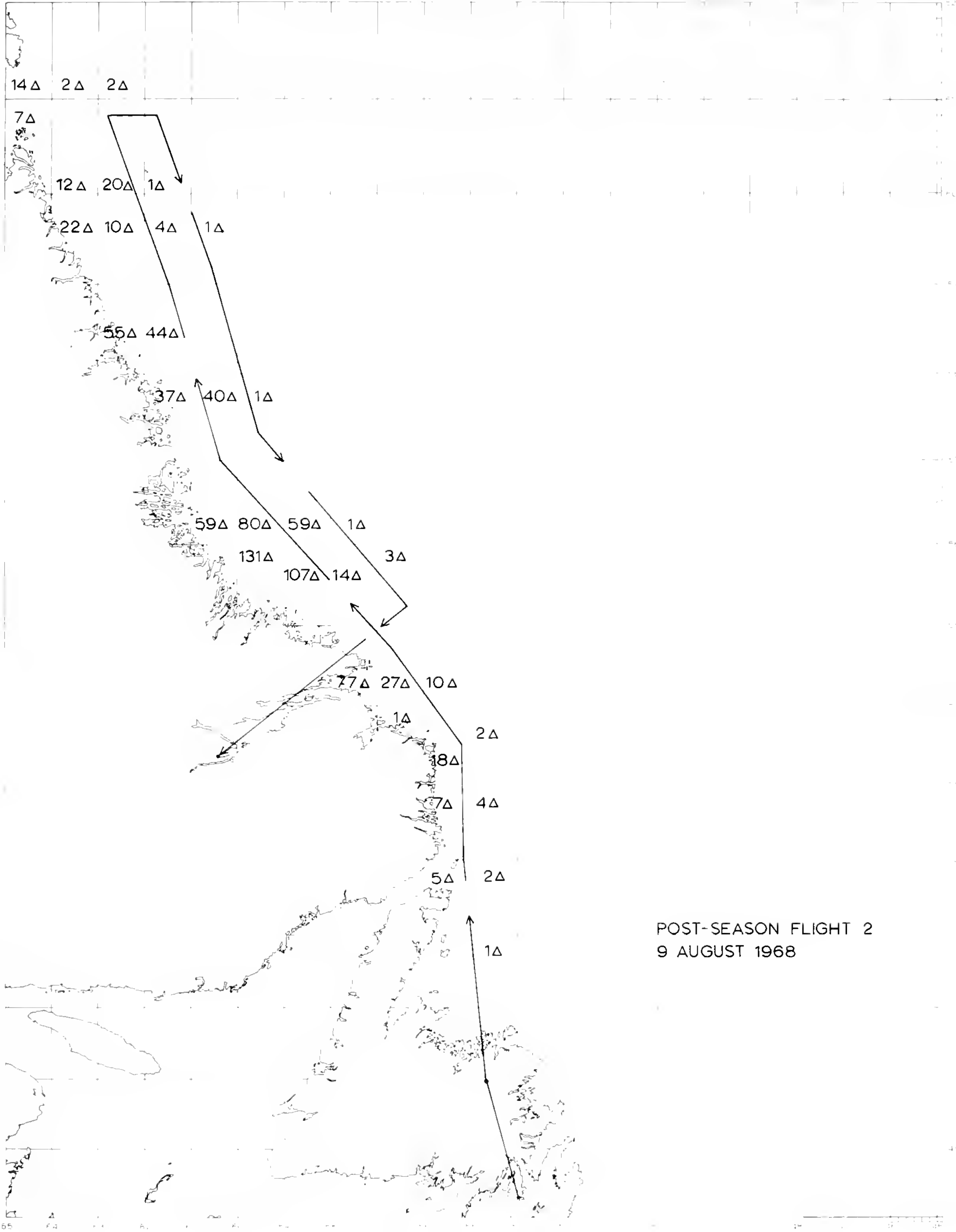

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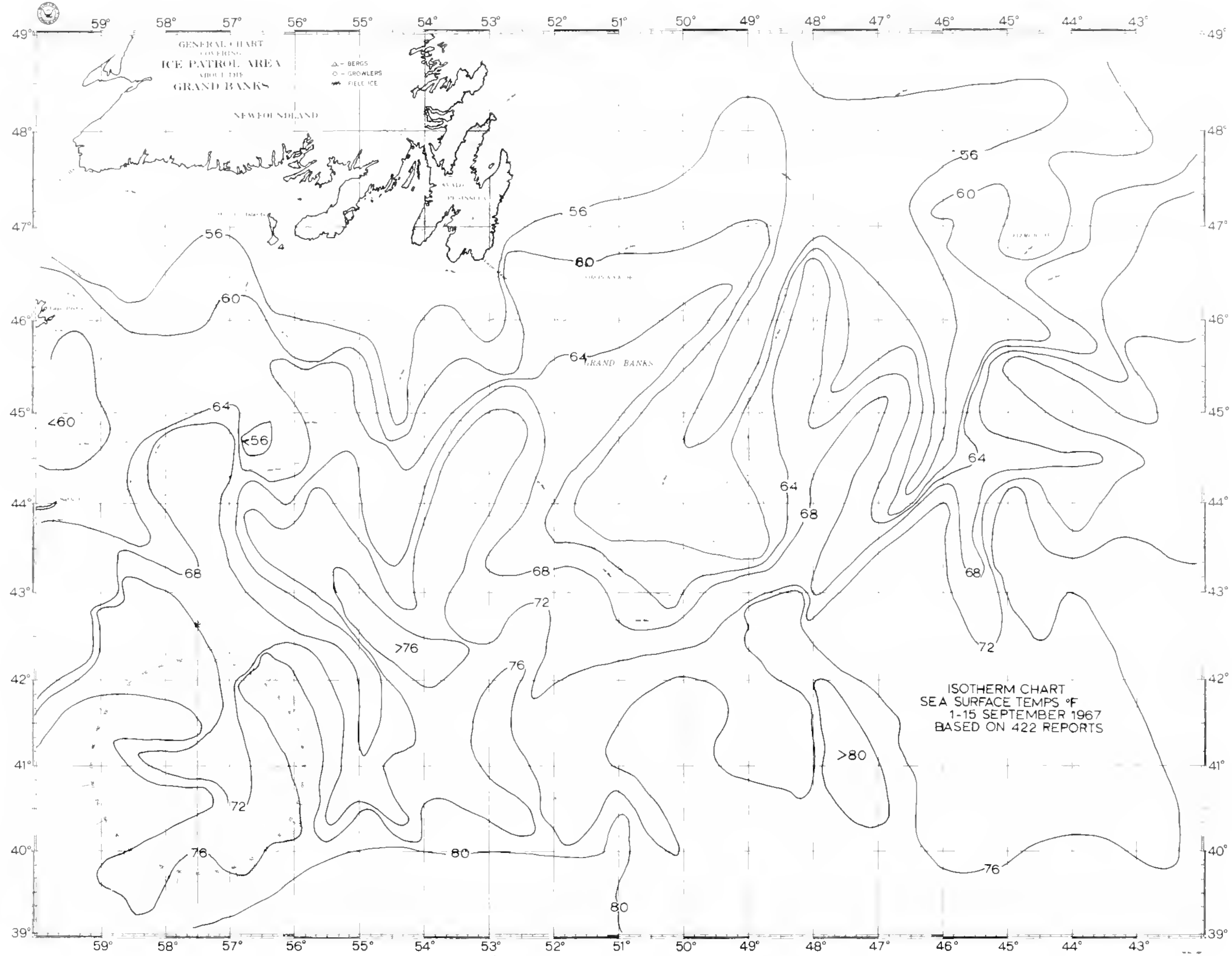


Figure 49.—Sea Temperature Isotherms, 1–15 September 1967.

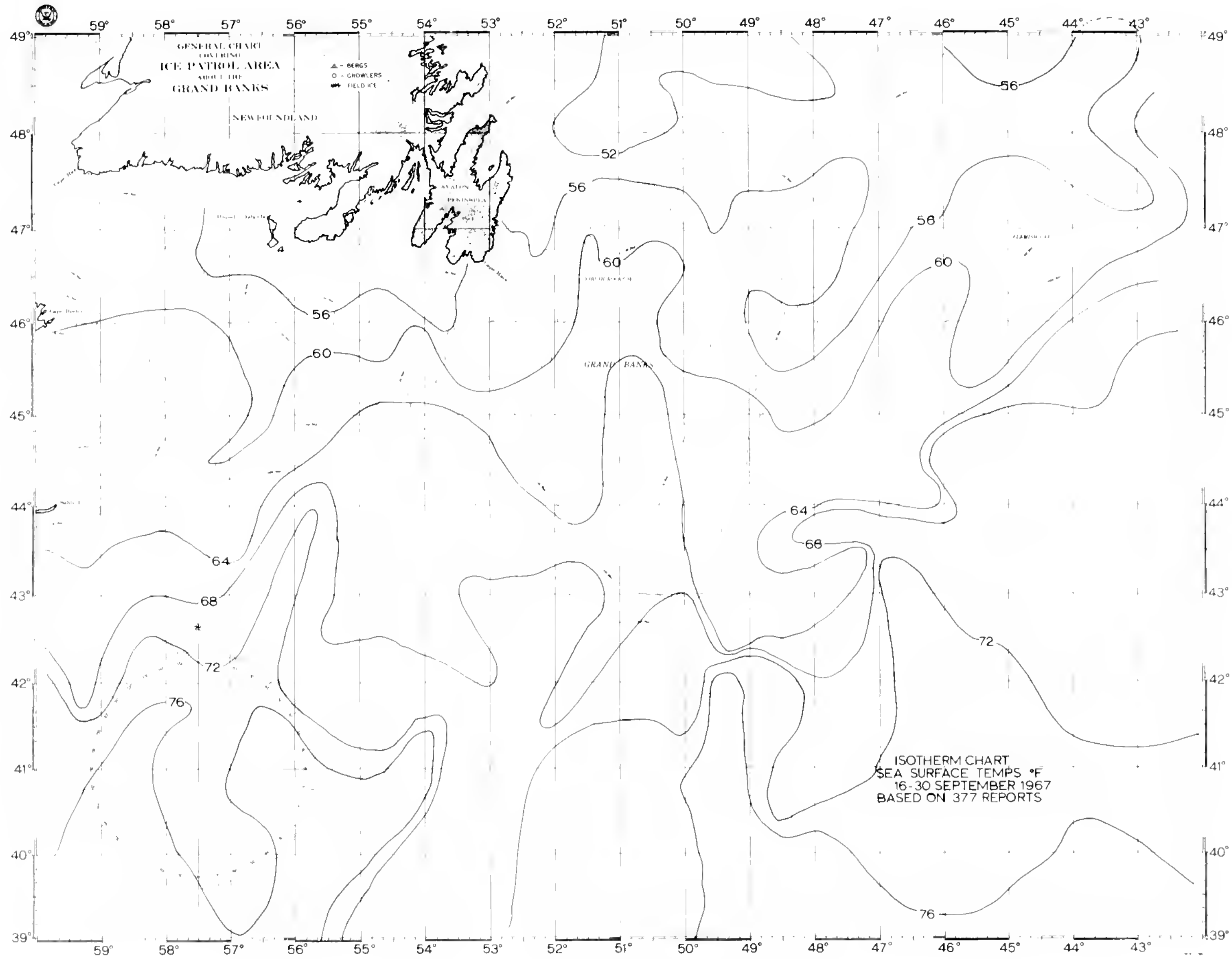


Figure 50.—Sea Temperature Isotherms, 16–30 September 1967.

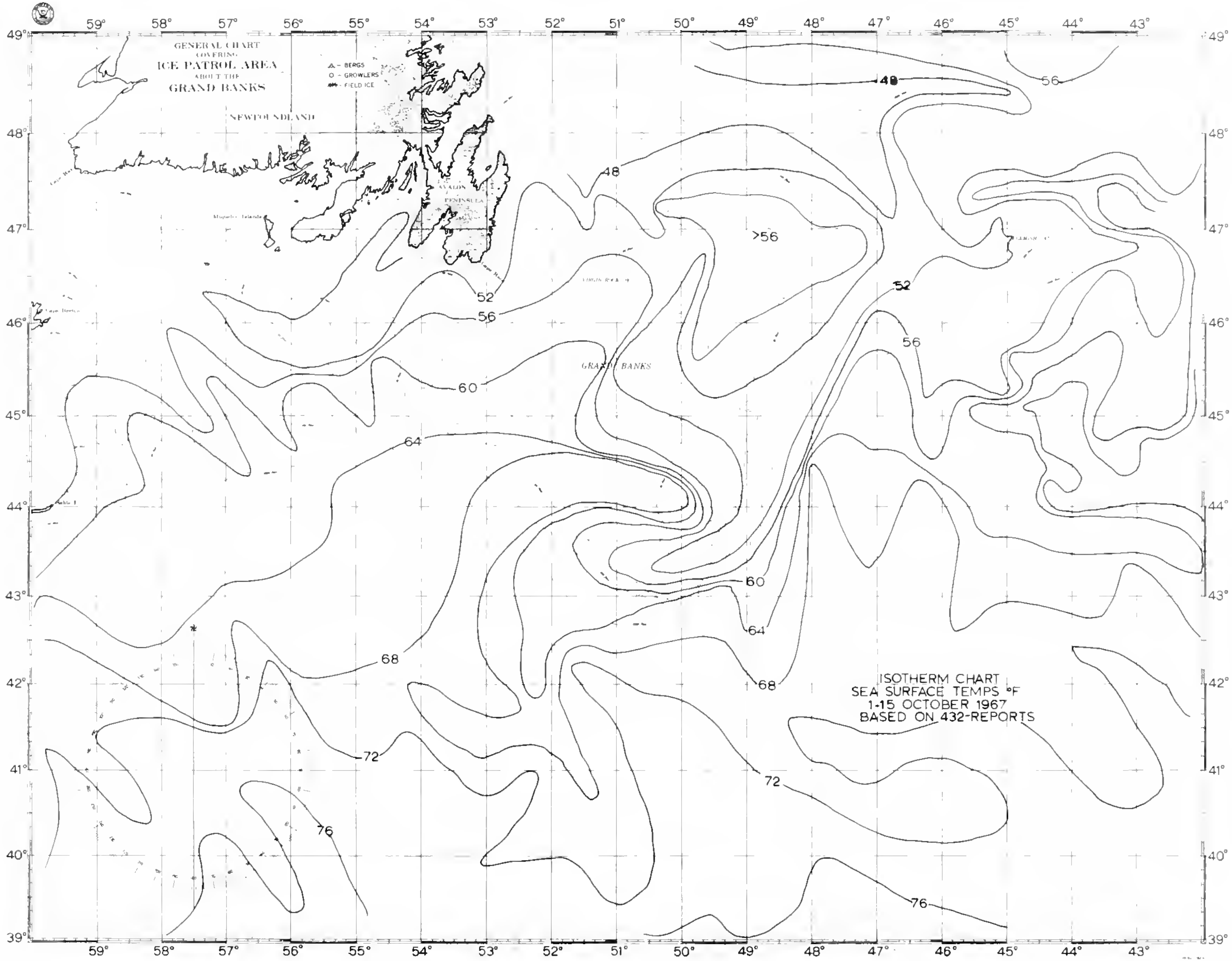


Figure 51.— Sea Temperature Isotherms, 1–15 October 1967.

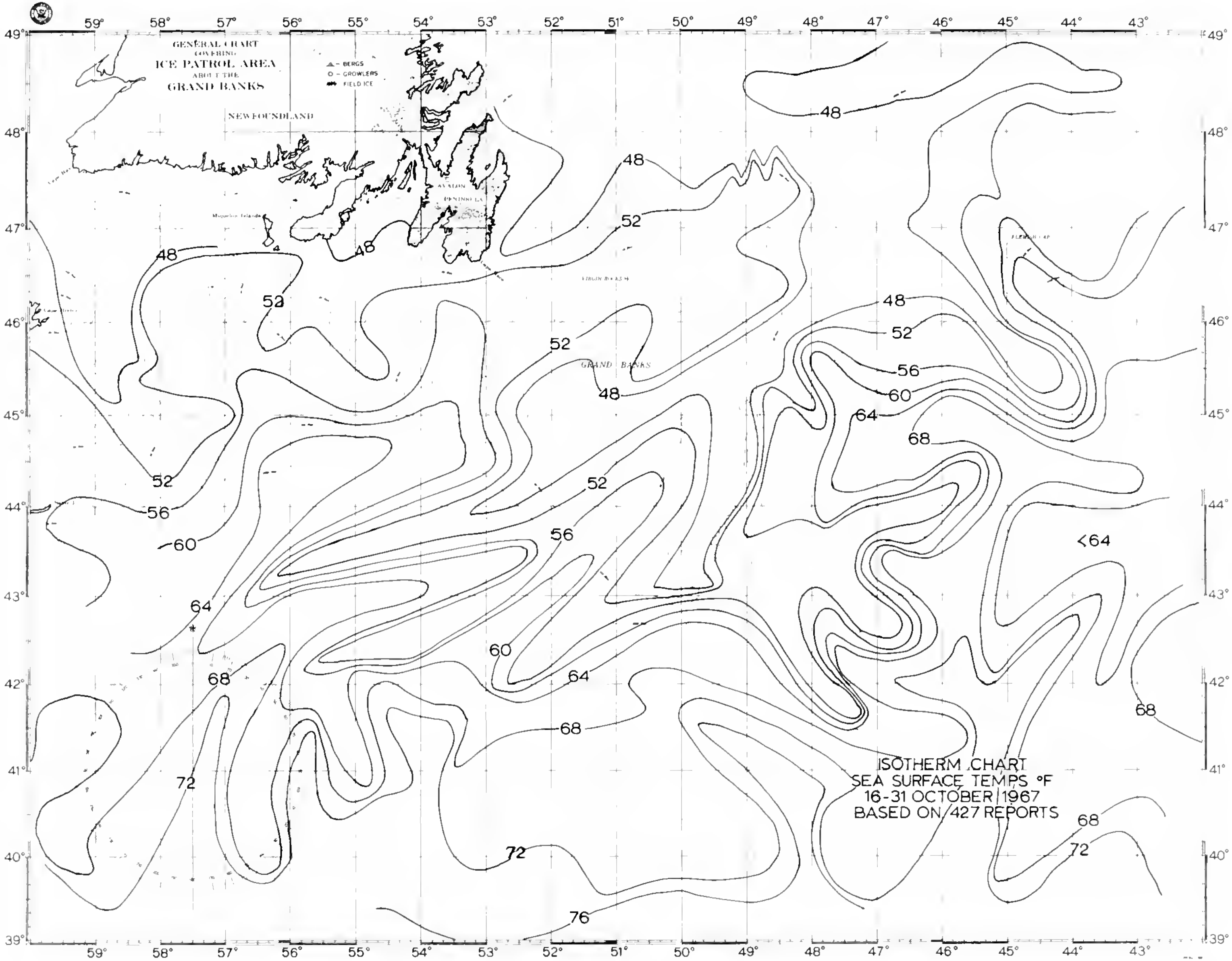


Figure 52.—Sea Temperature Isotherms, 16–31 October 1967.

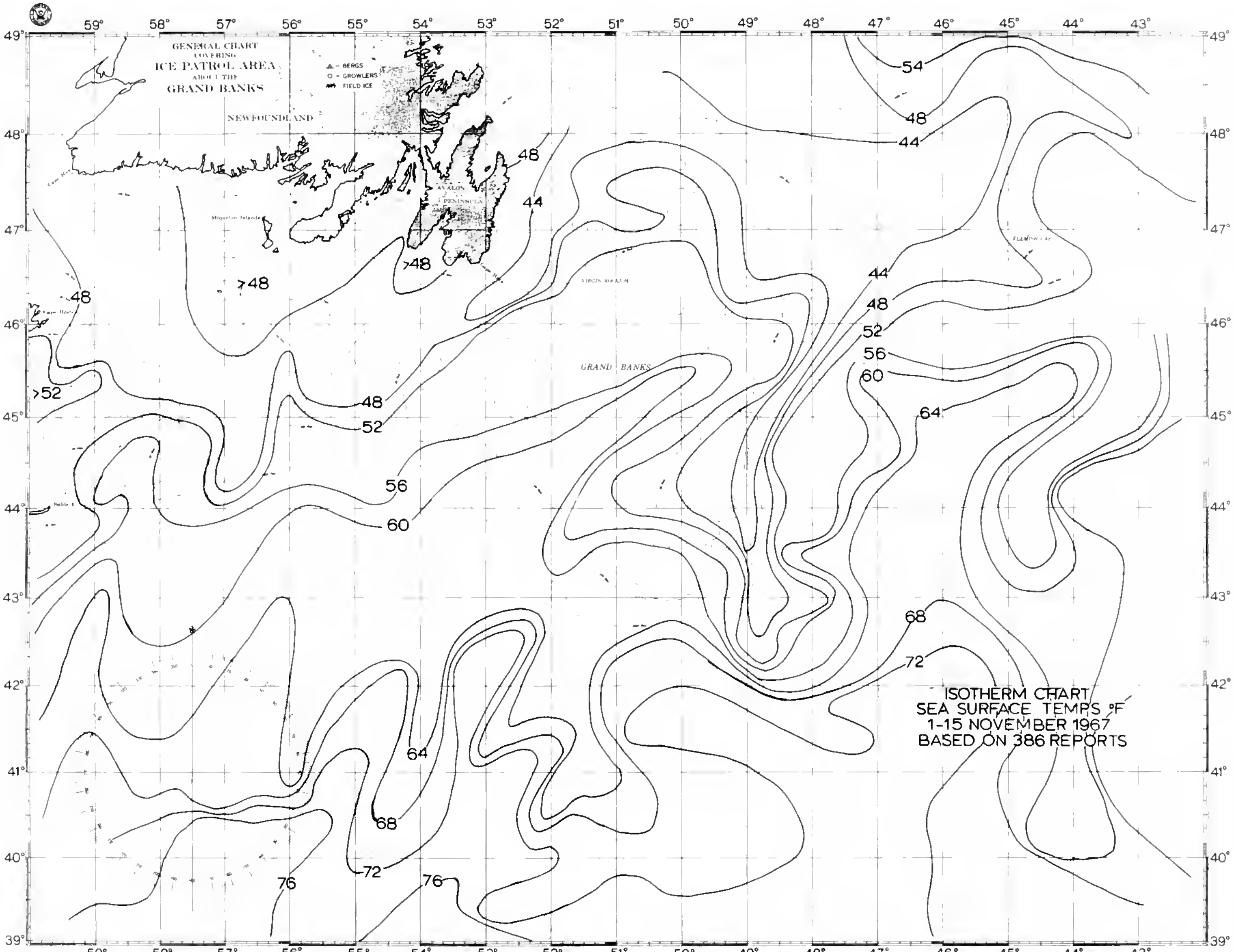


Figure 53.—Sea Temperature Isotherms, 1–15 November 1967.

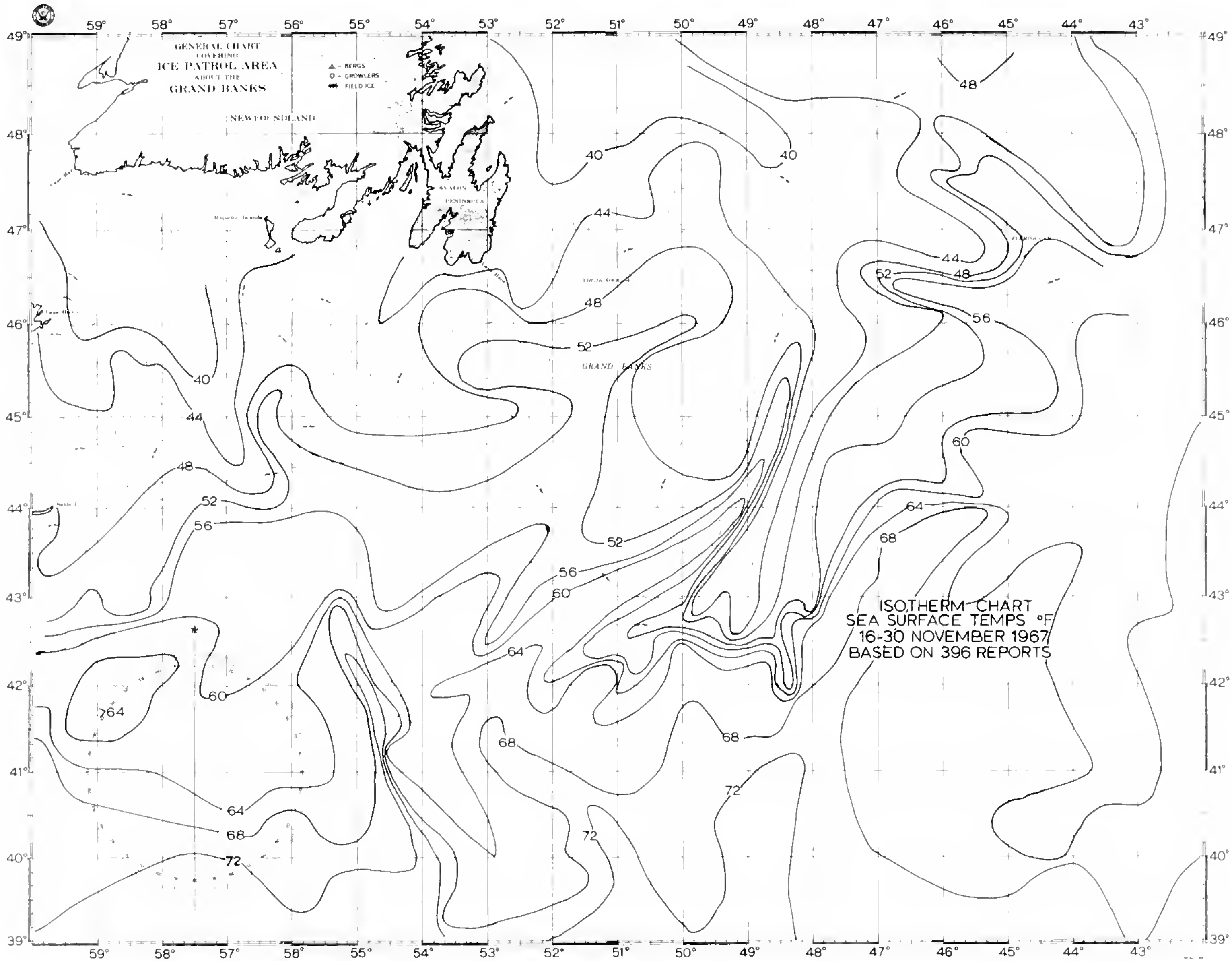


Figure 54.—Sea Temperature Isotherms, 16–30 November 1967.

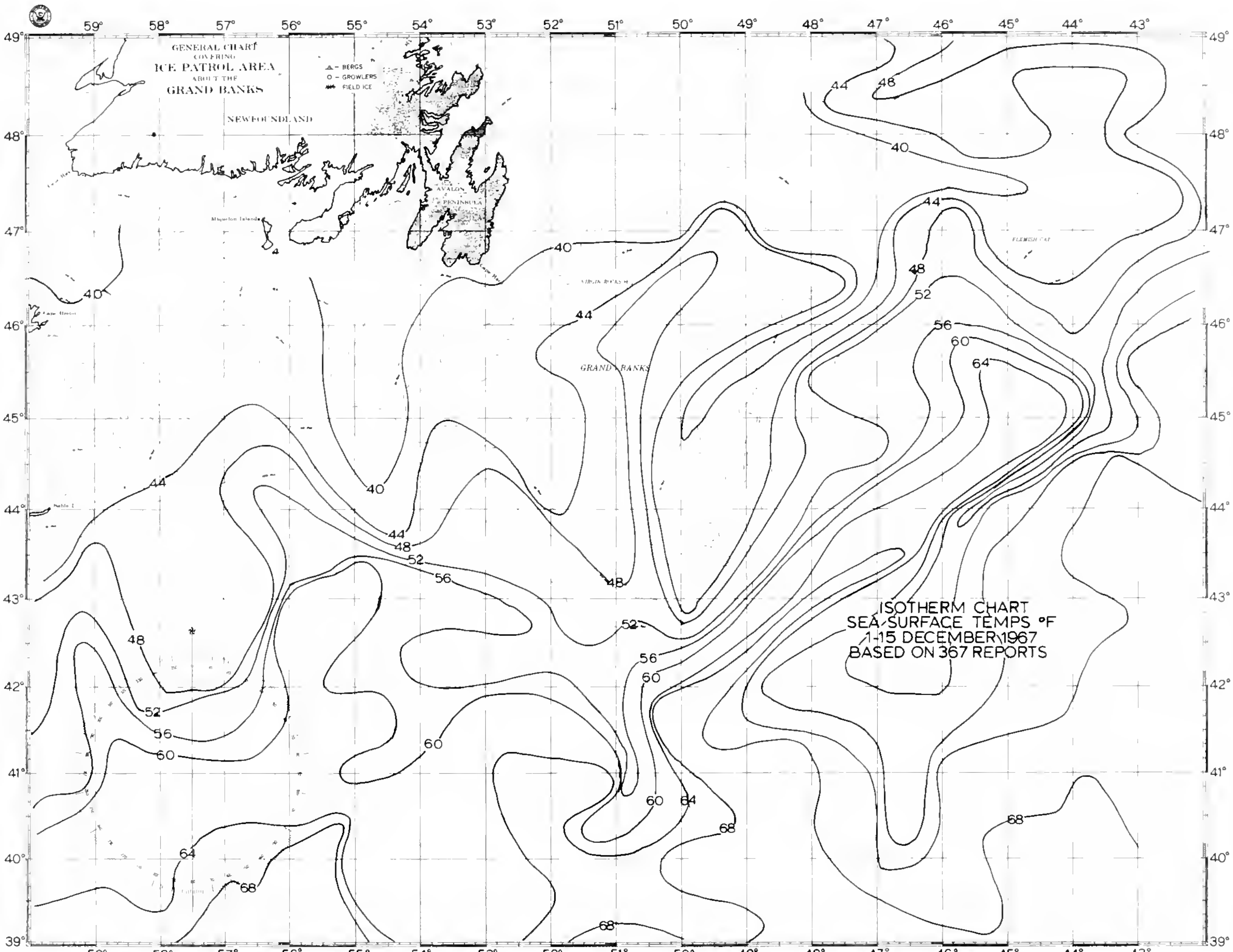


Figure 55.—Sea Temperature Isotherms, 1–15 December 1967.

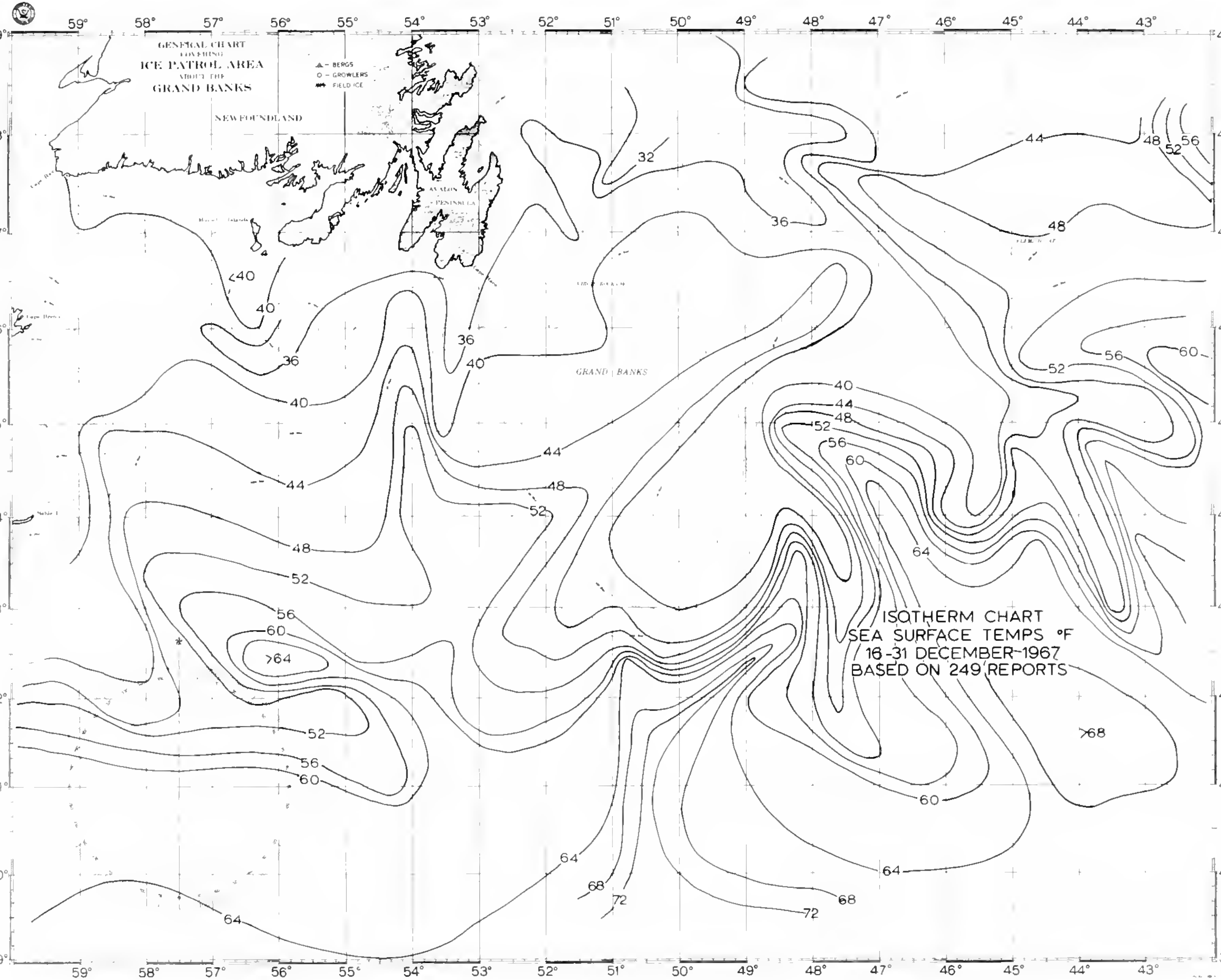


Figure 56.—**Sea Temperature Isotherms, 16–31 December 1967.**

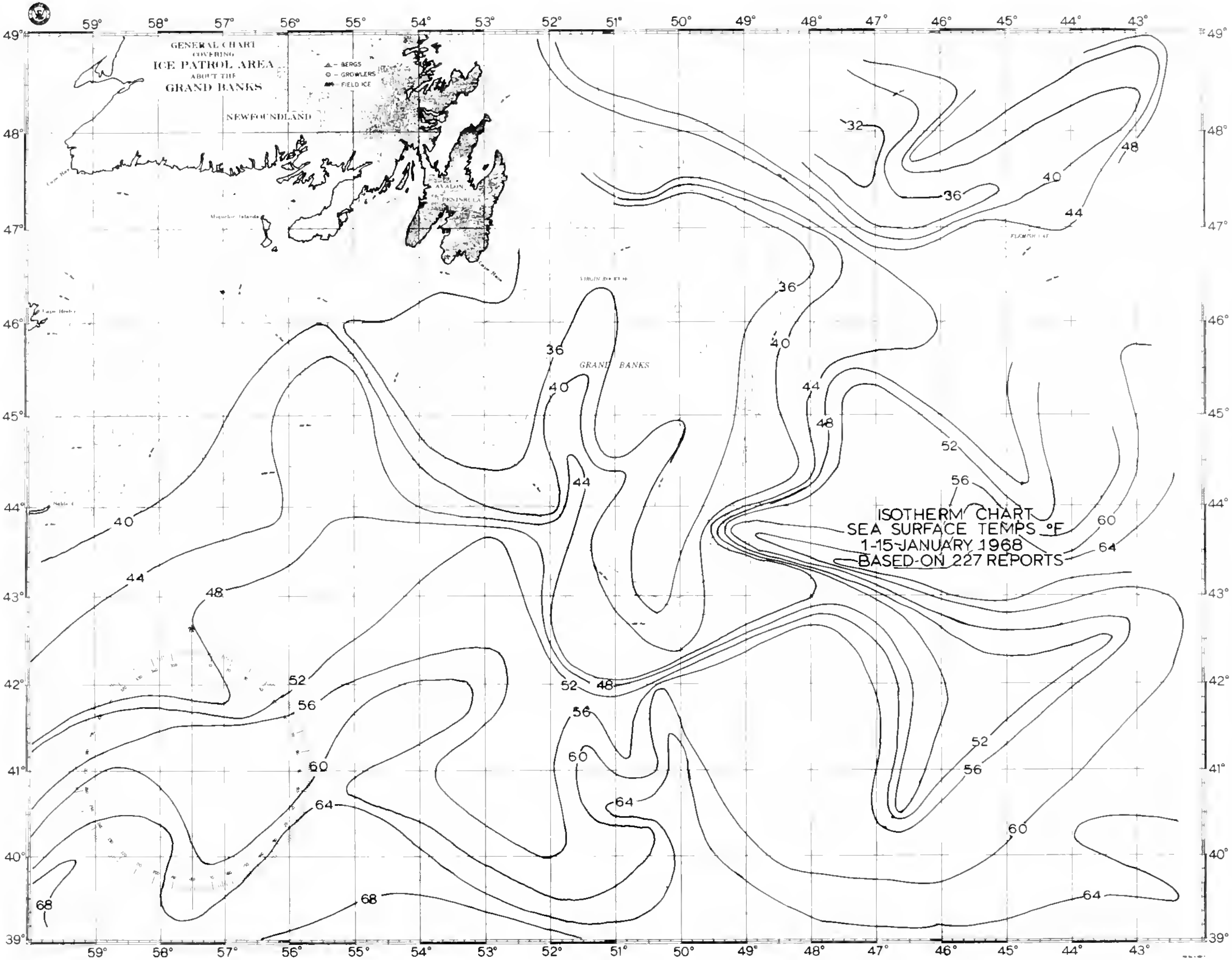


Figure 57.—Sea Temperature Isotherms, 1–15 January 1968.

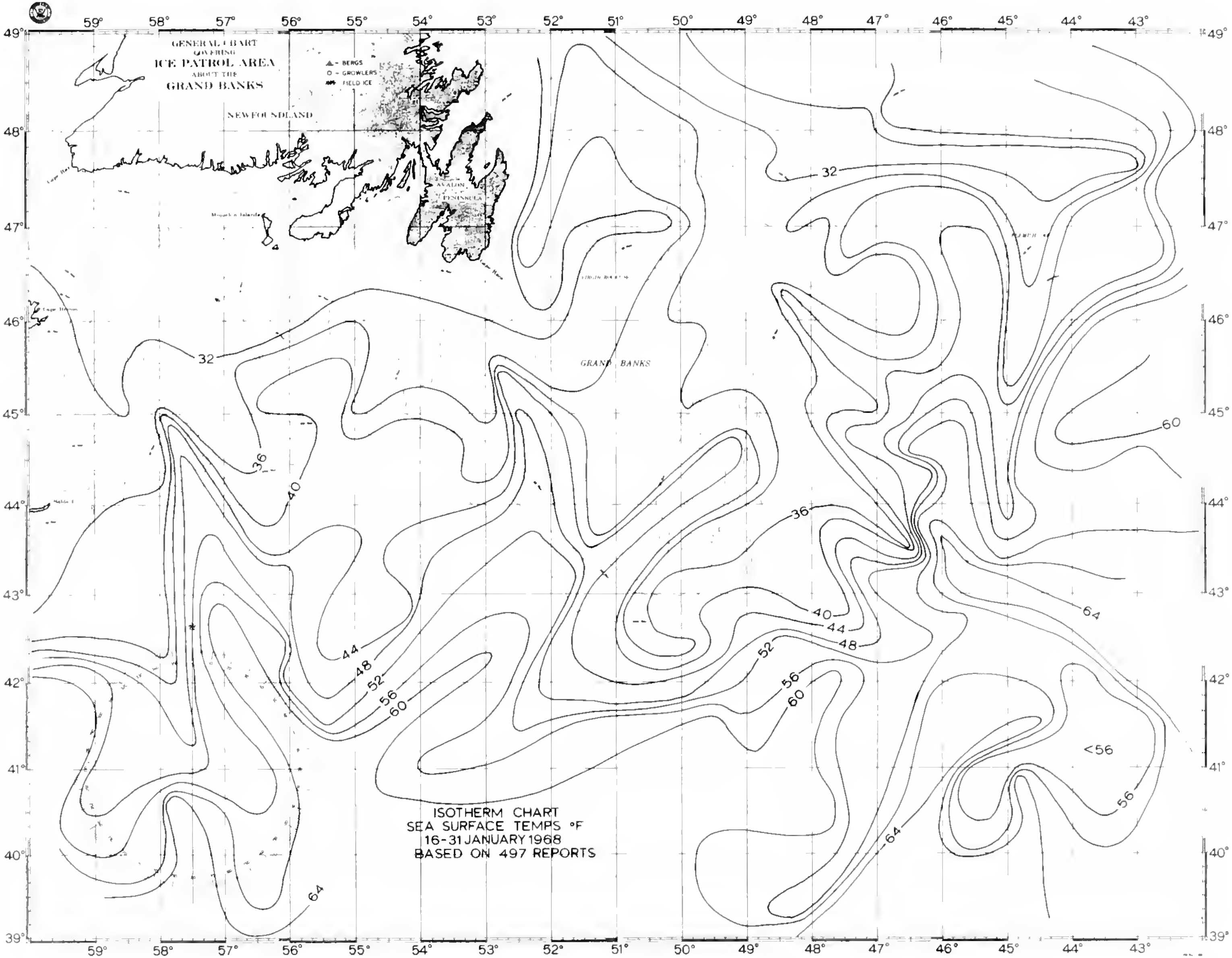
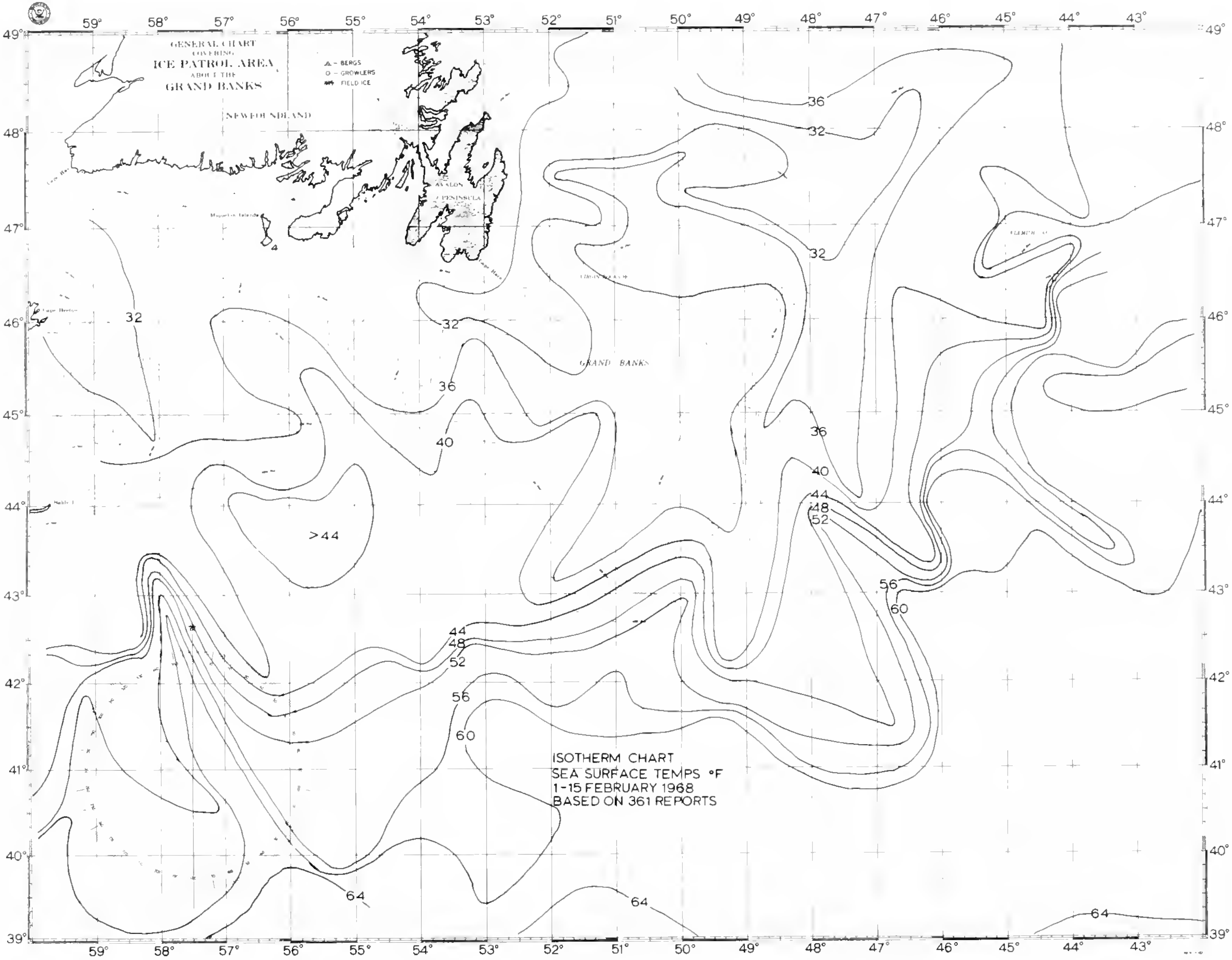


Figure 58.—Sea Temperature Isotherms, 16–31 January 1968.



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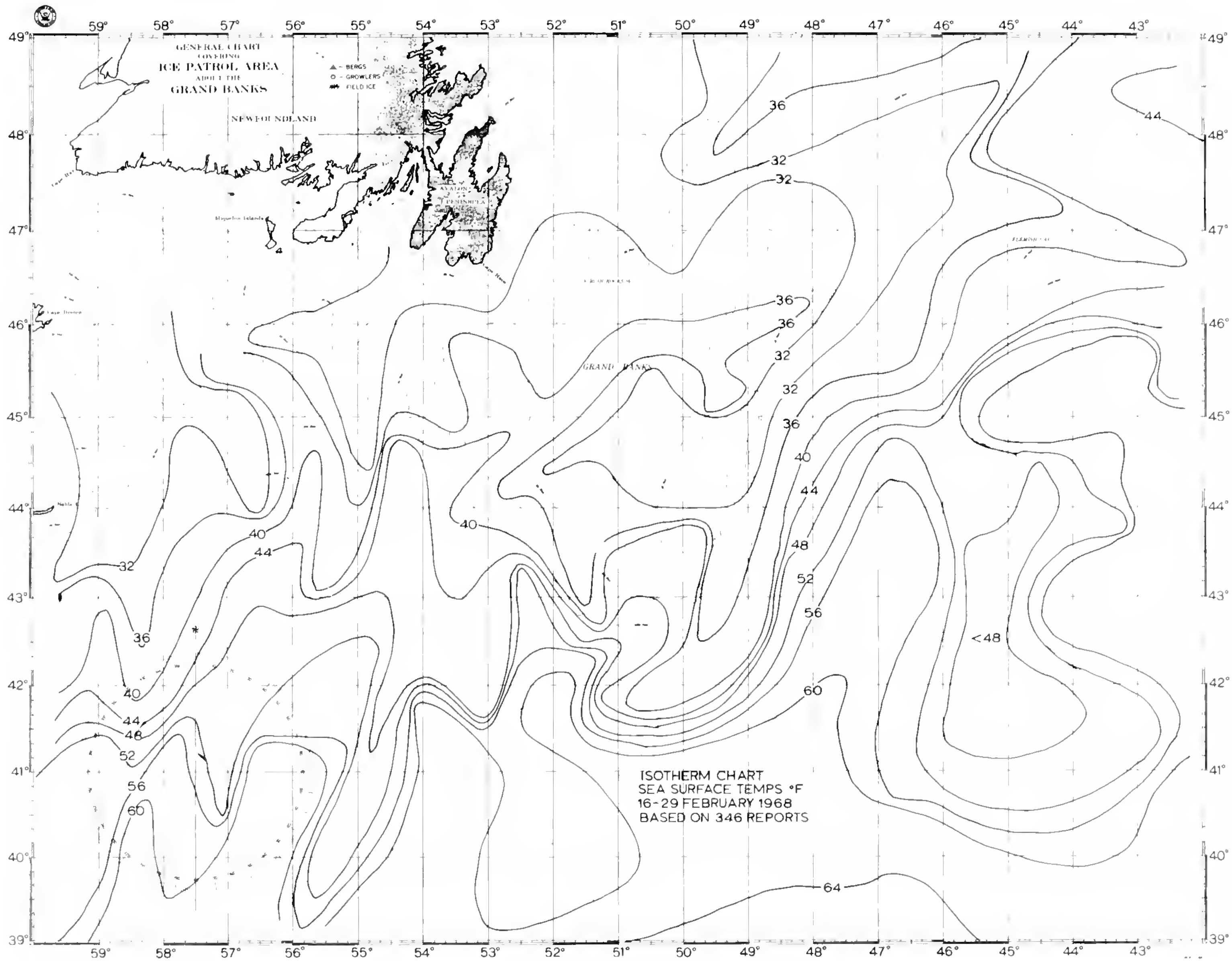
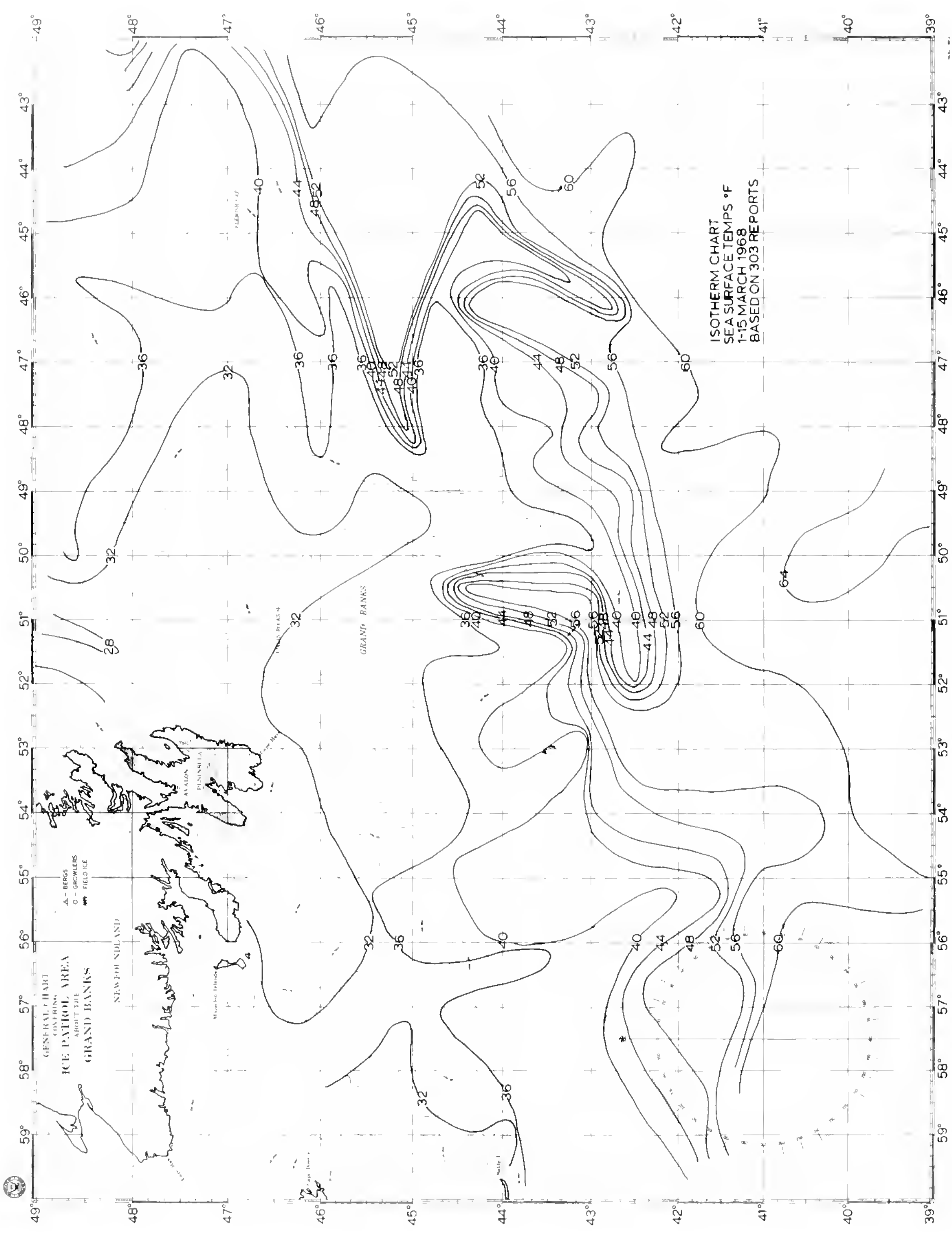


Figure 60.—Sea Temperature Isotherms, 16–29 February 1968.



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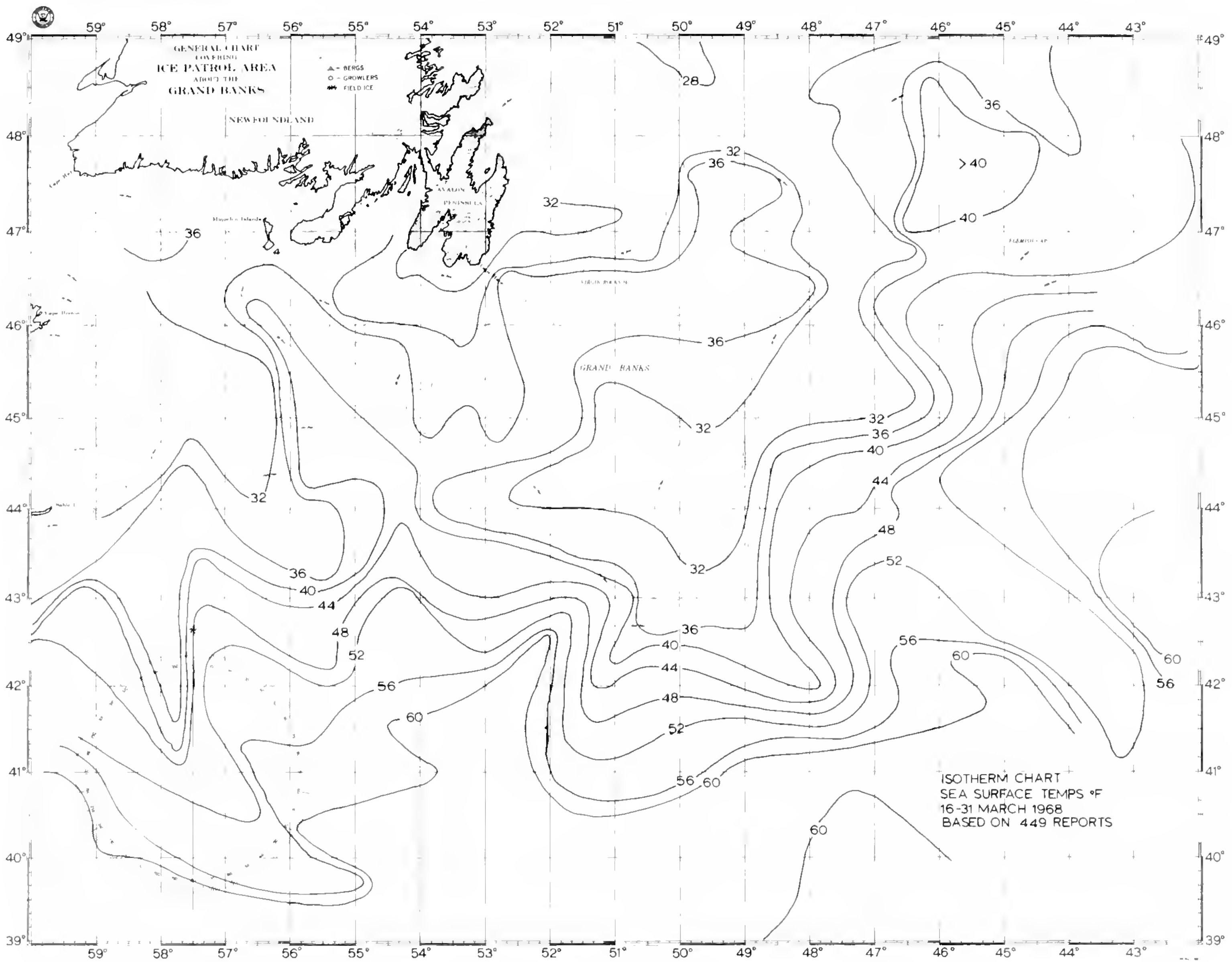
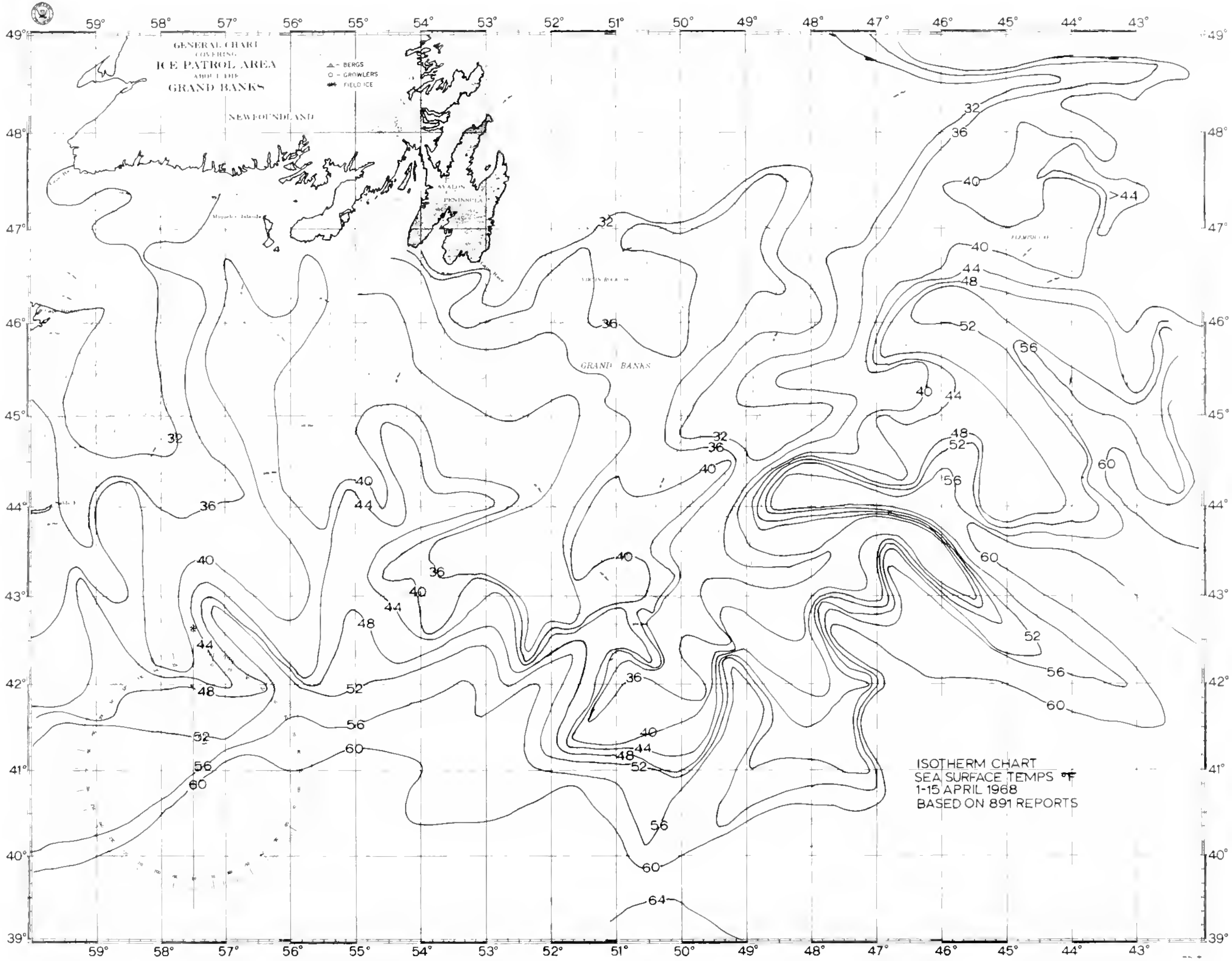


Figure 62.—Sea Temperature Isotherms, 16–31 March 1968.



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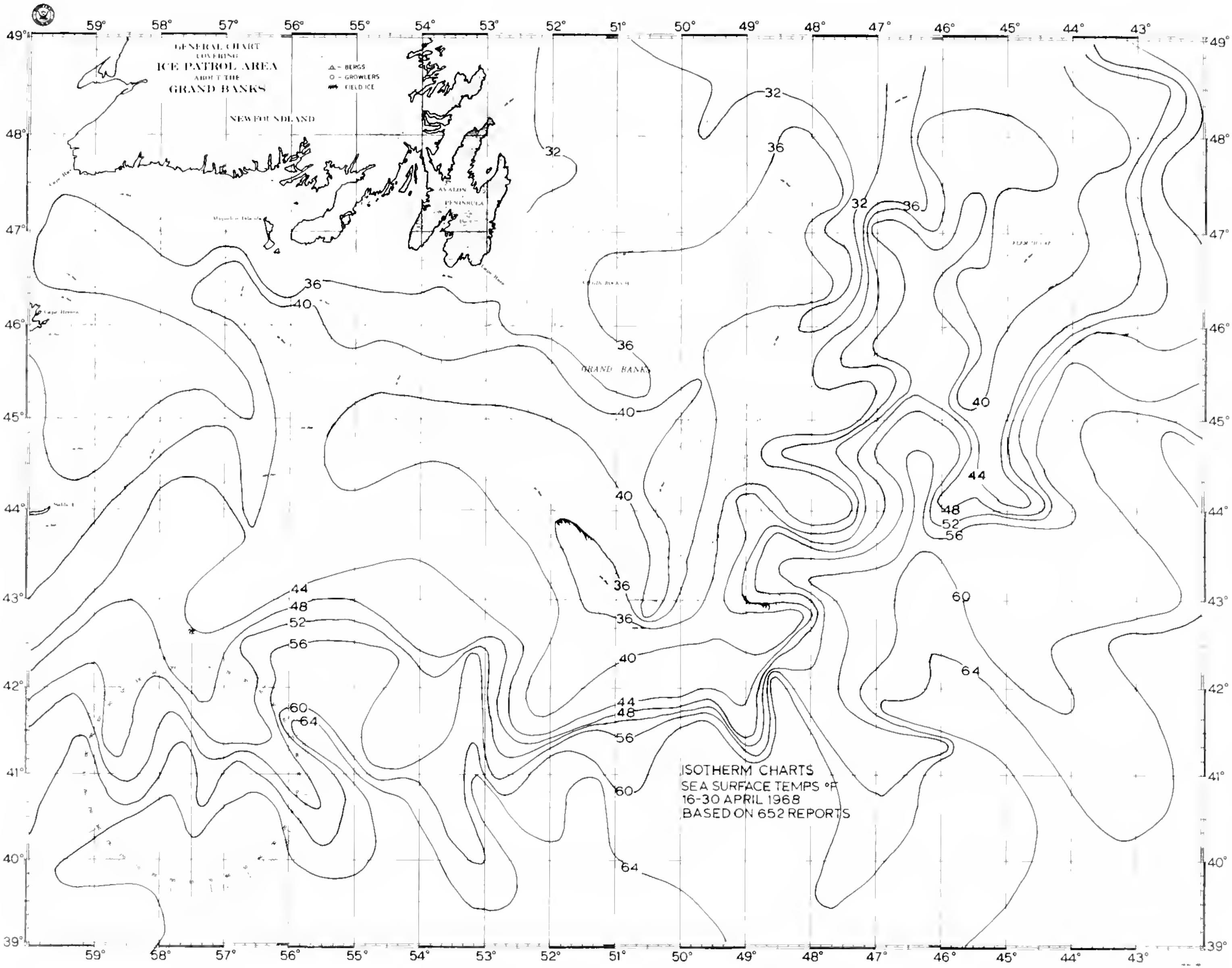


Figure 64.—Sea Temperature Isotherms, 16–30 April 1968.

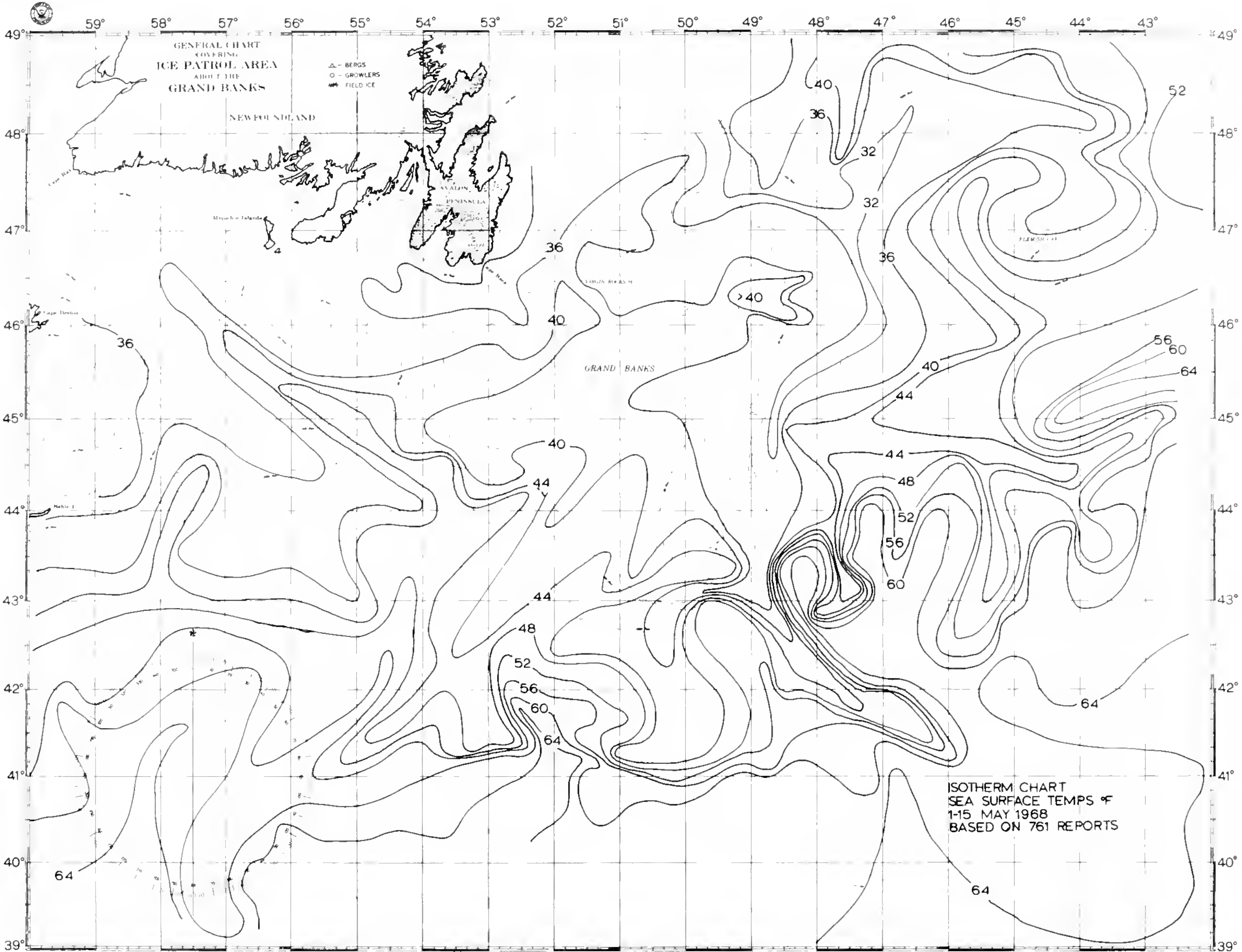
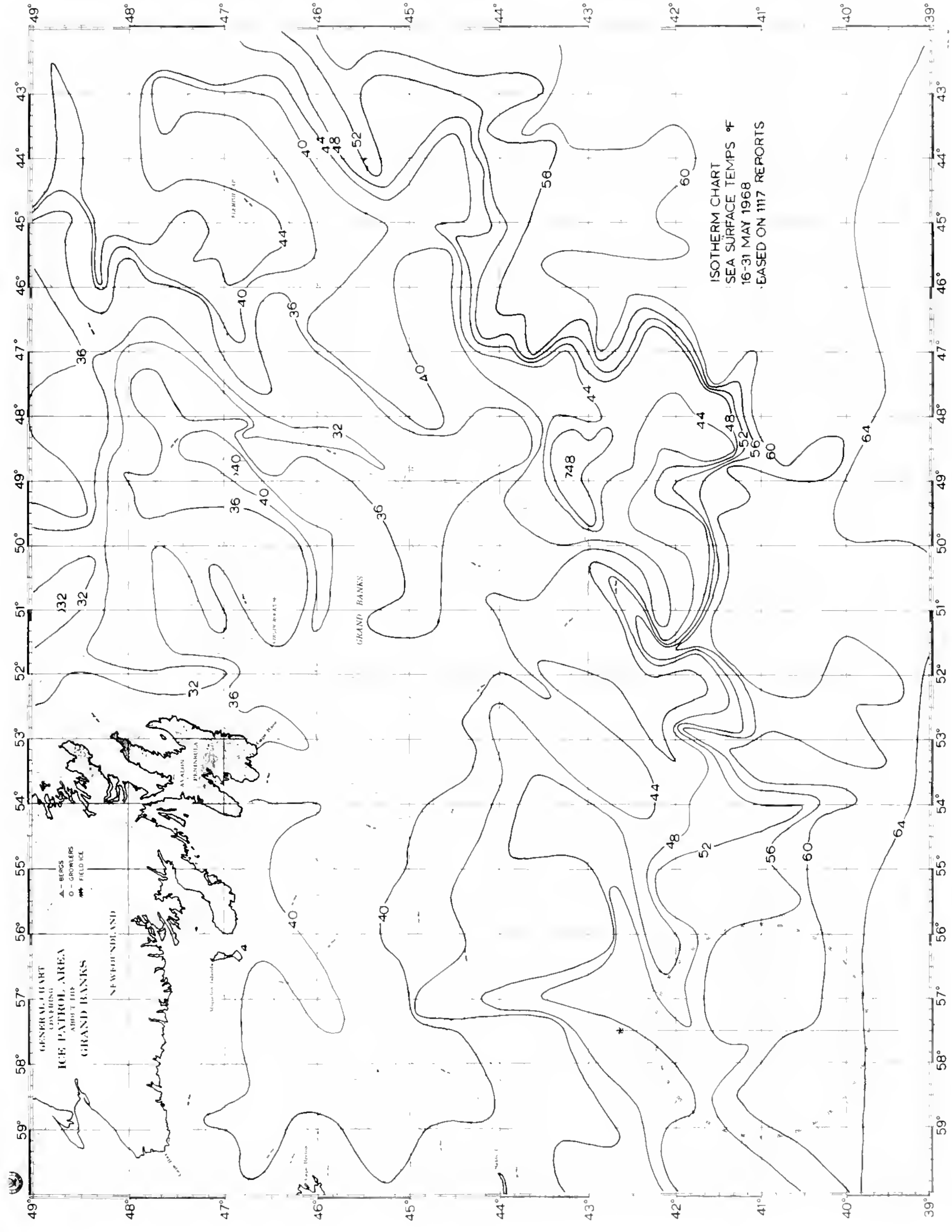


Figure 65.—Sea Temperature Isotherms, 1–15 May 1968.



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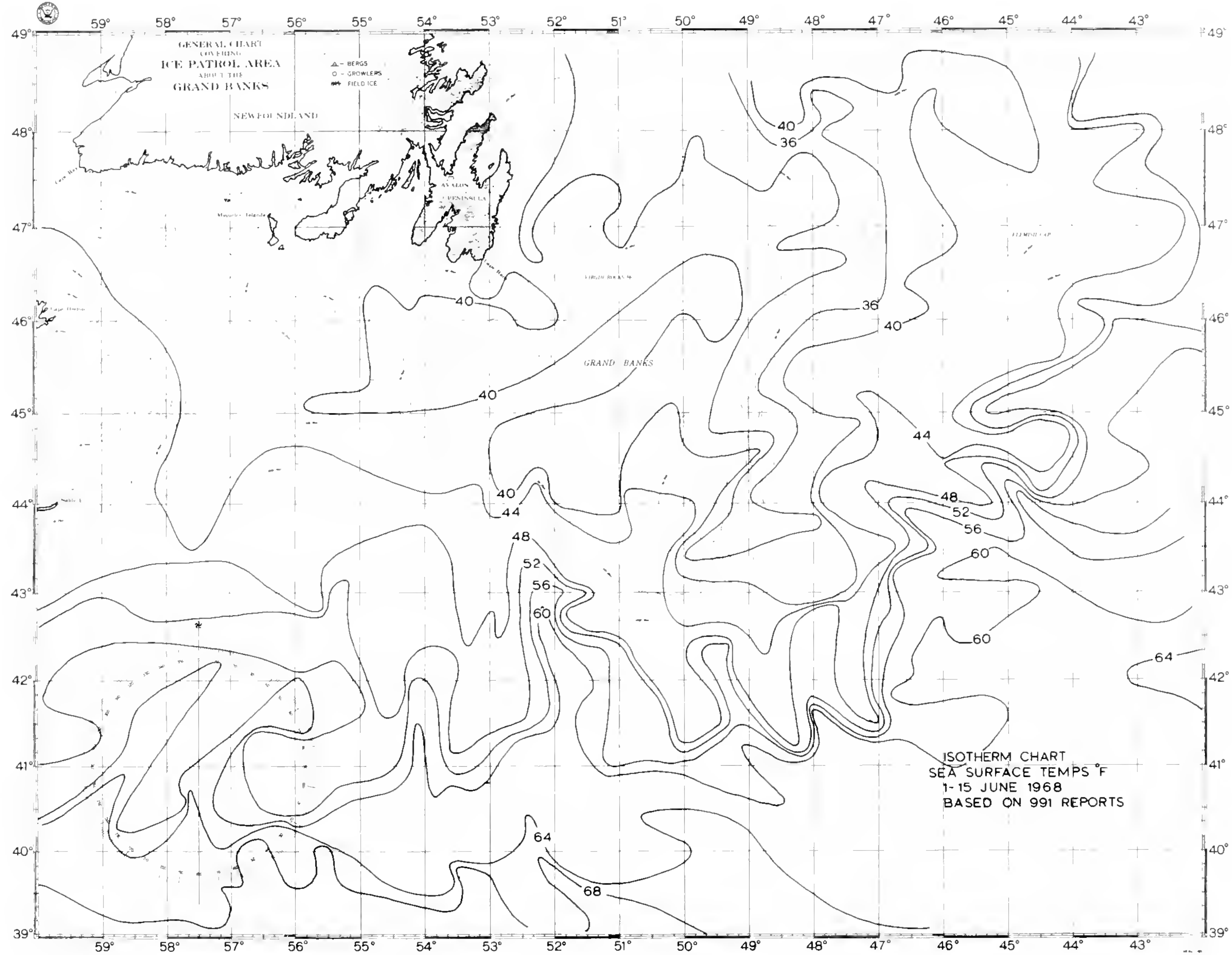

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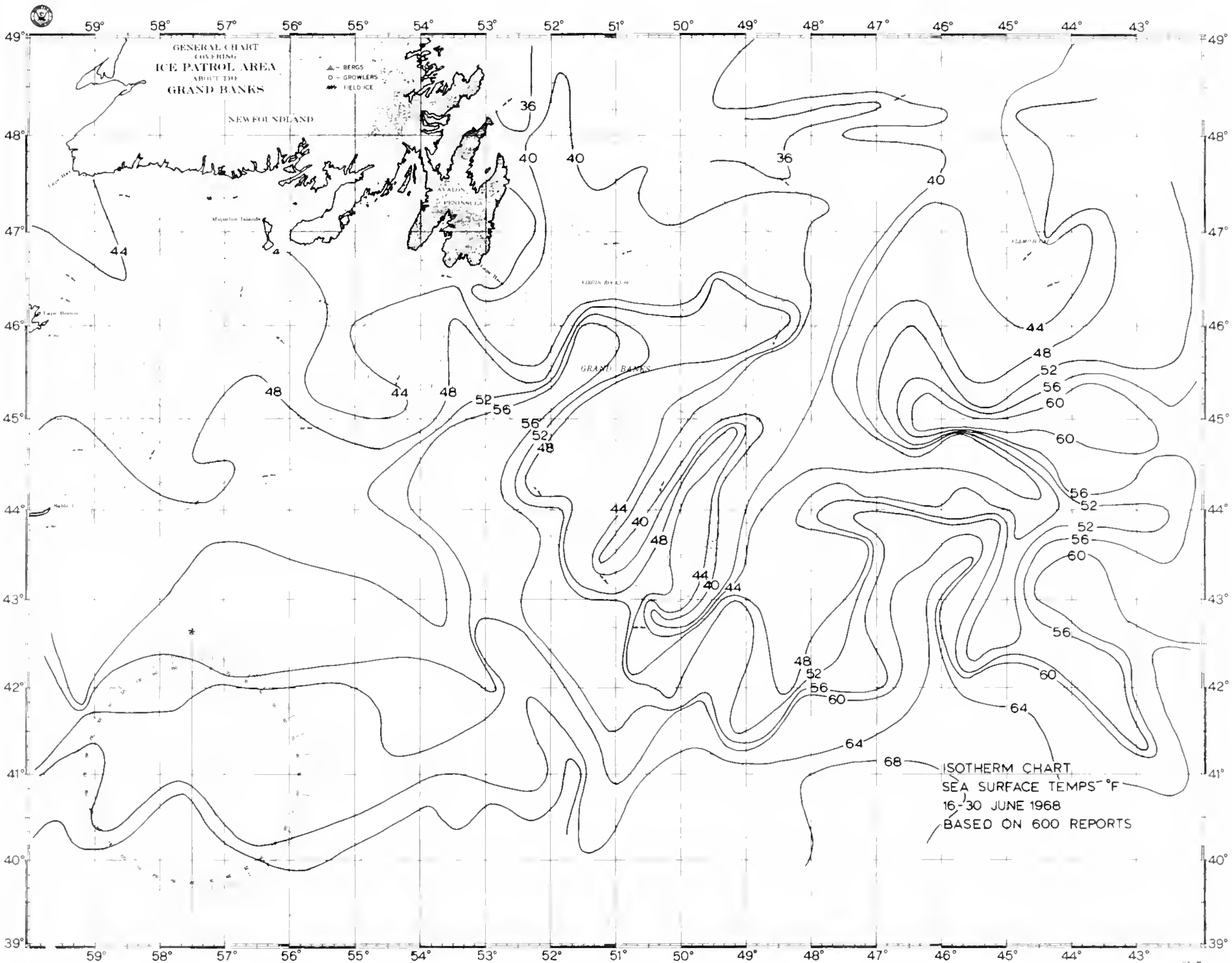


Figure 68.—Sea Temperature Isotherms, 16–30 June 1968.

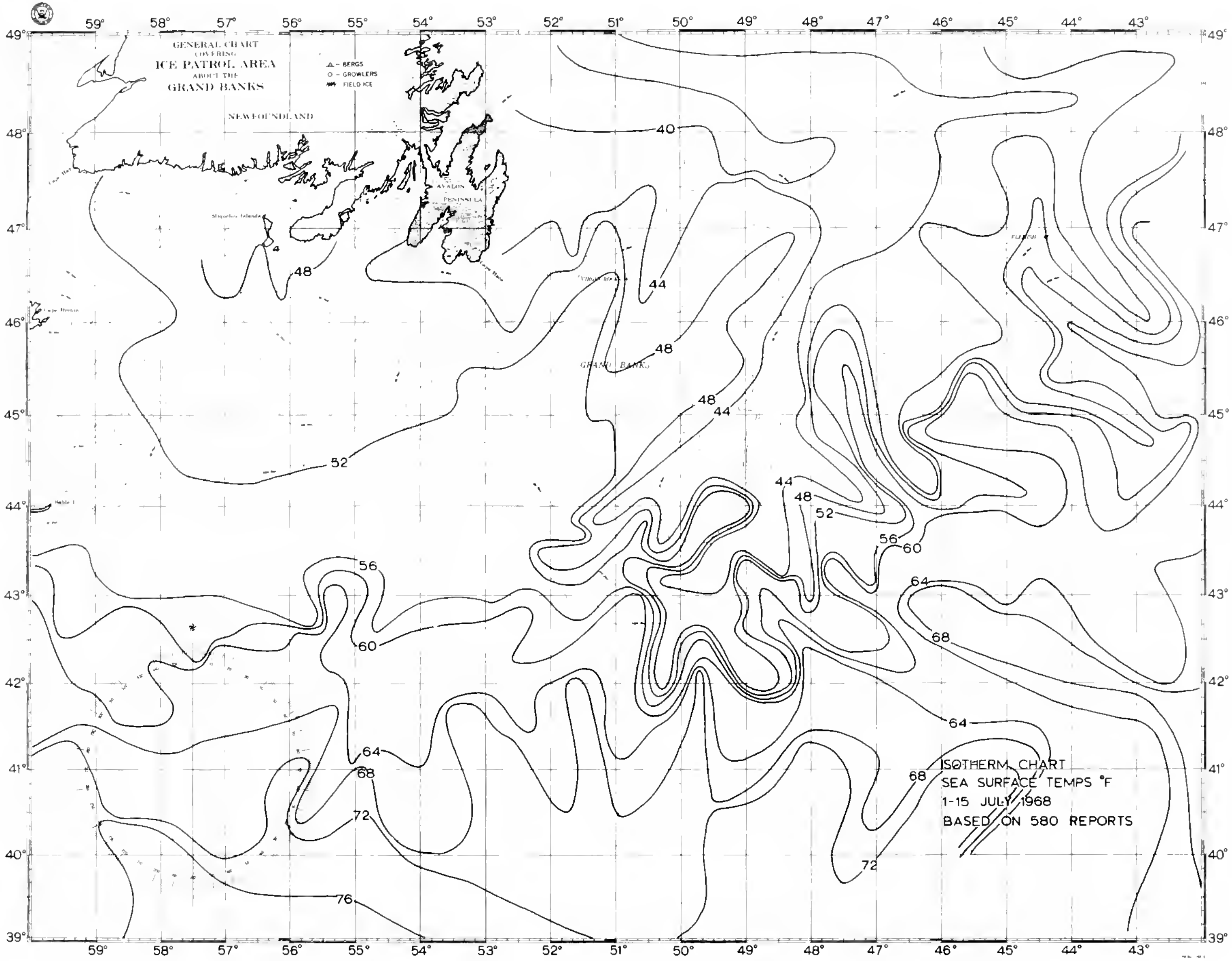


Figure 69.—Sea Temperature Isotherms, 1–15 July 1968.

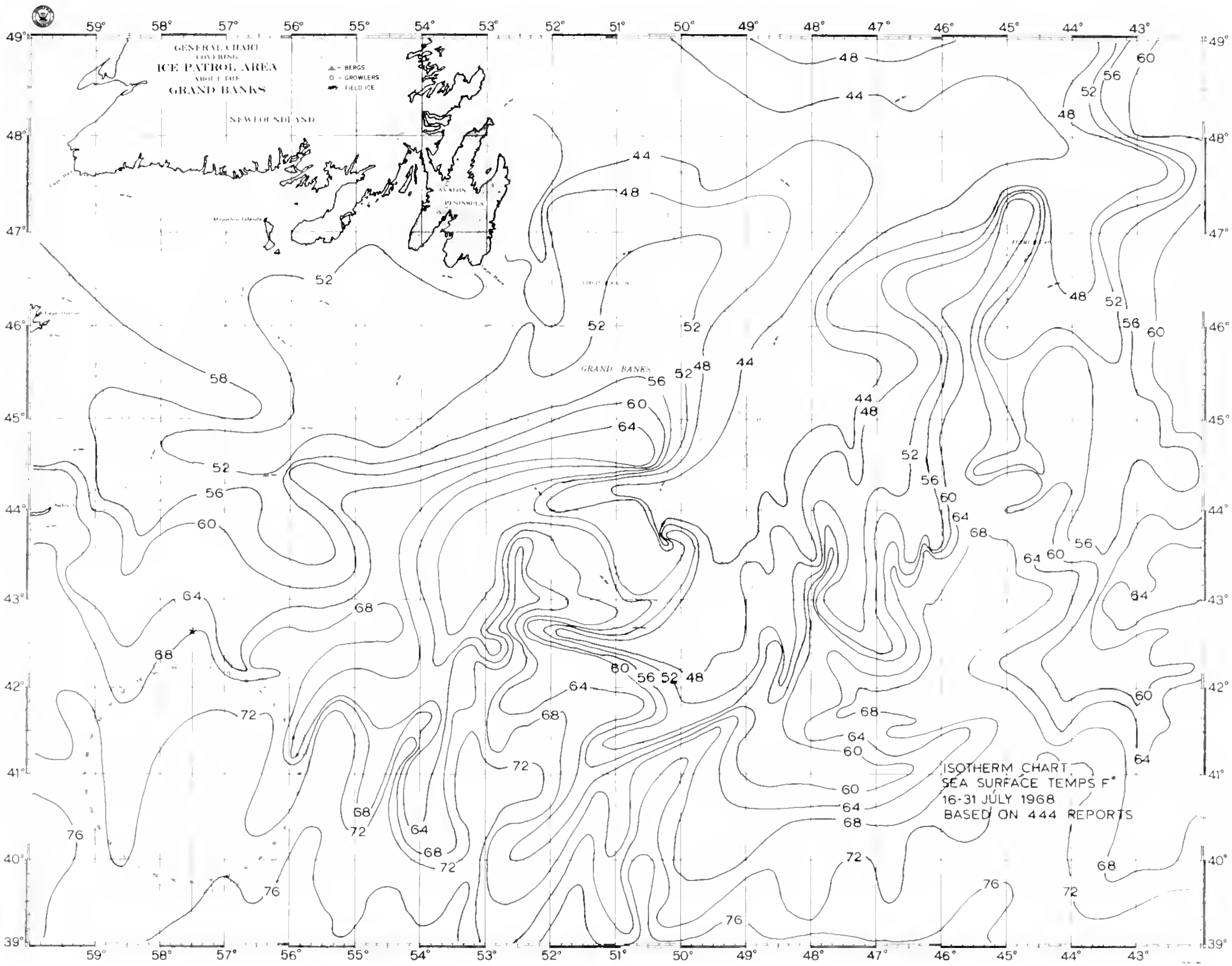
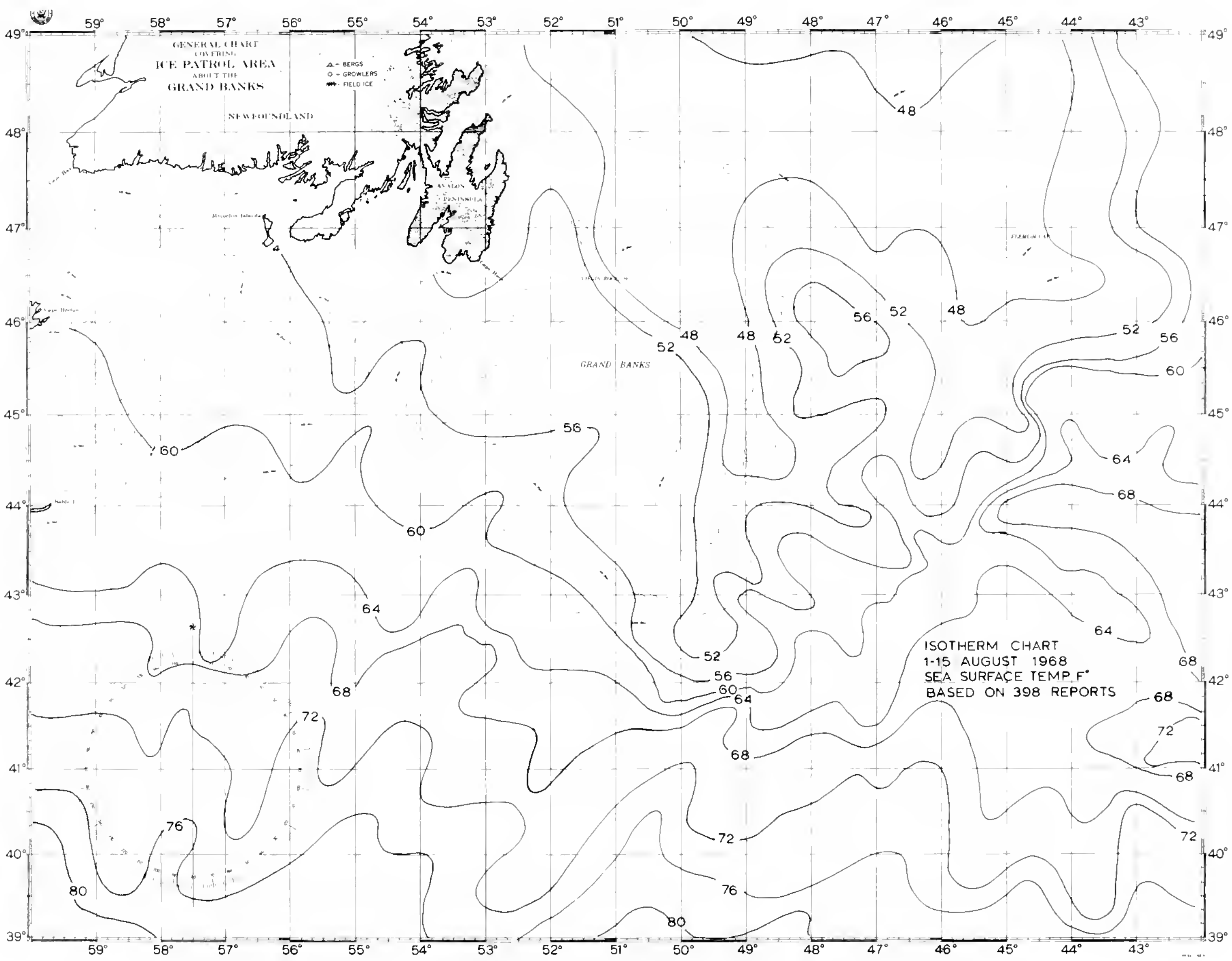


Figure 70.—Sea Temperature Isotherms, 16–31 July 1968.



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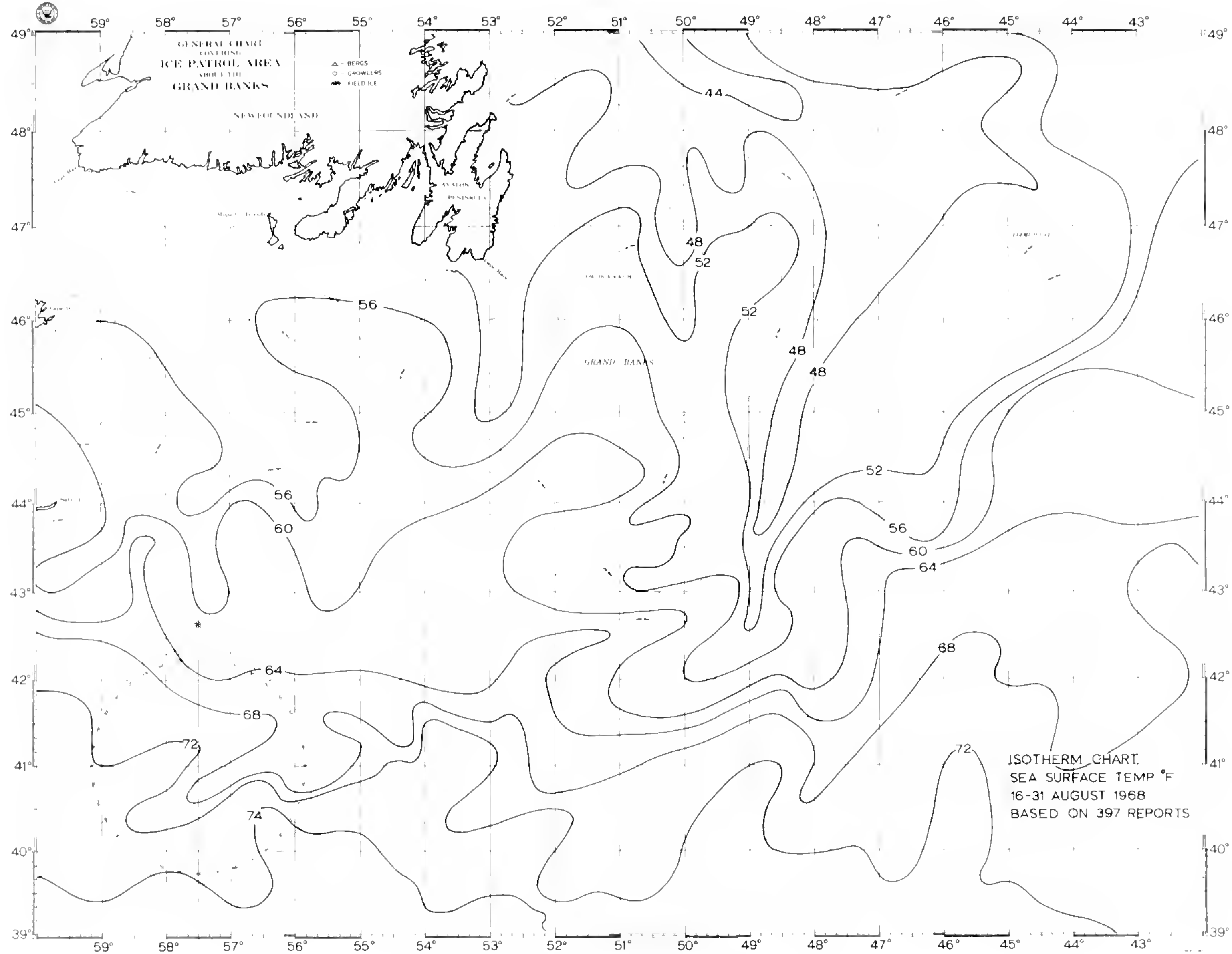


Figure 72.—Sea Temperature Isotherms, 16–31 August 1968.

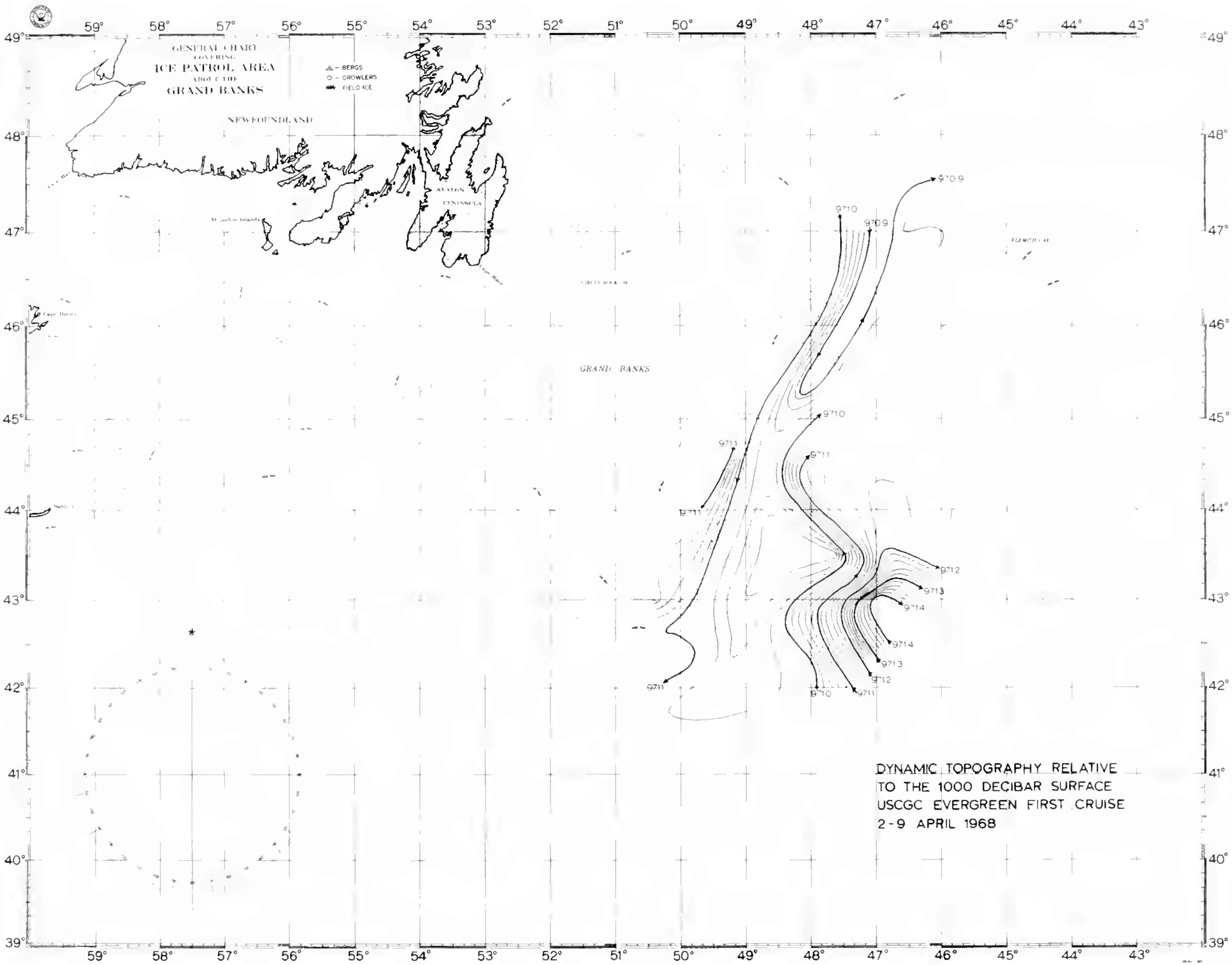
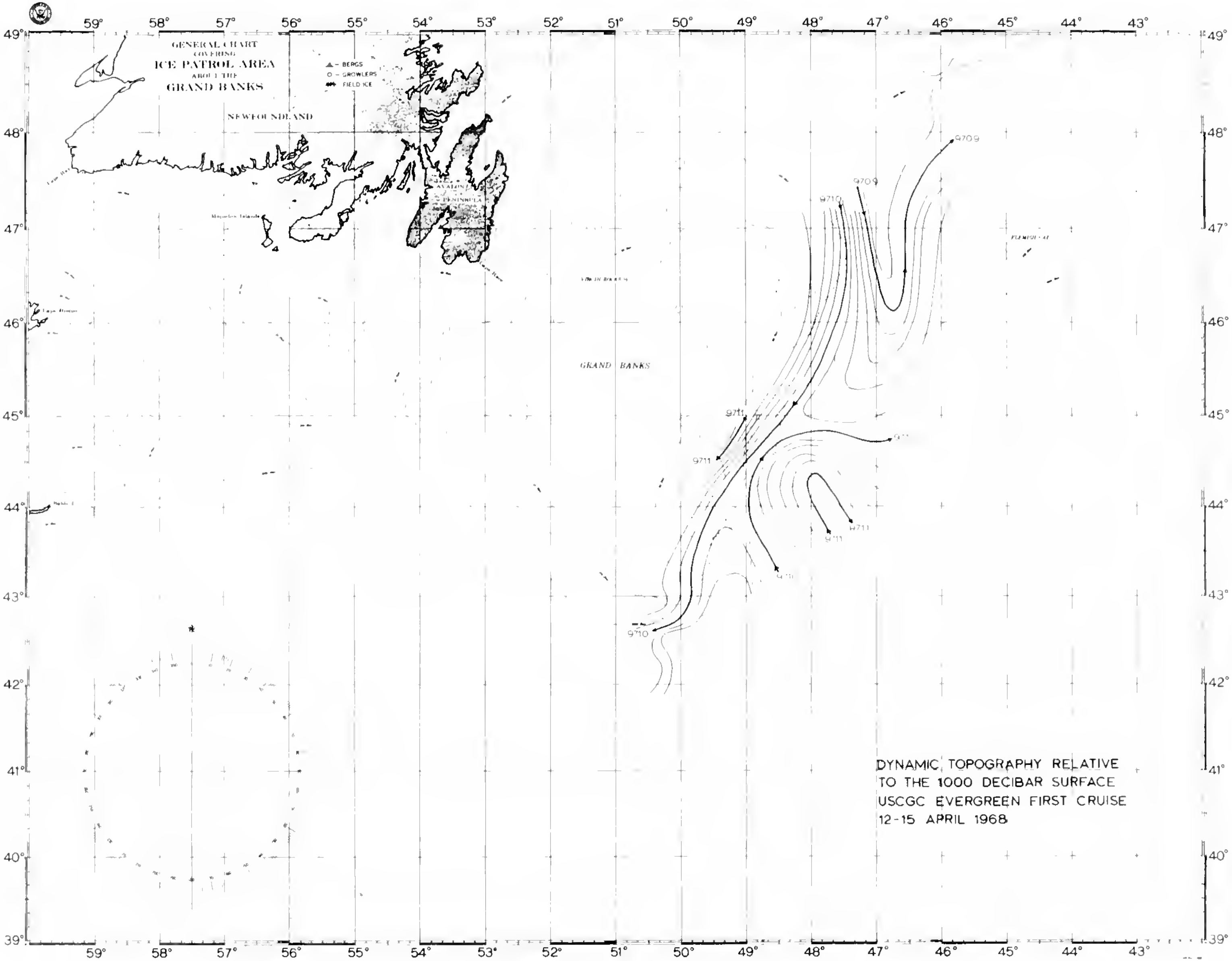


Figure 73.—Dynamic Topography, 2–9 April 1968.



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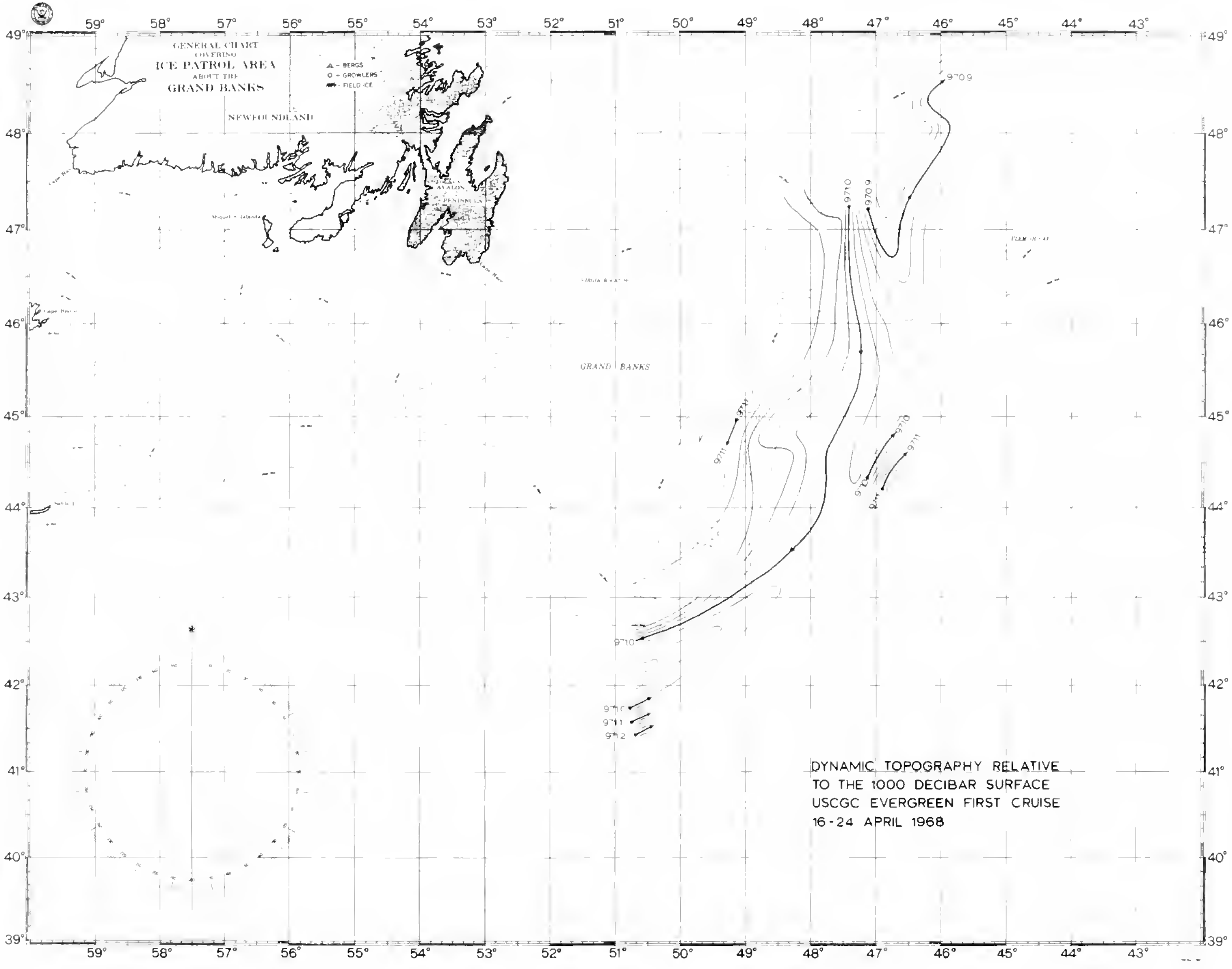


Figure 75.—**Dynamic Topography, 16–24 April 1968.**

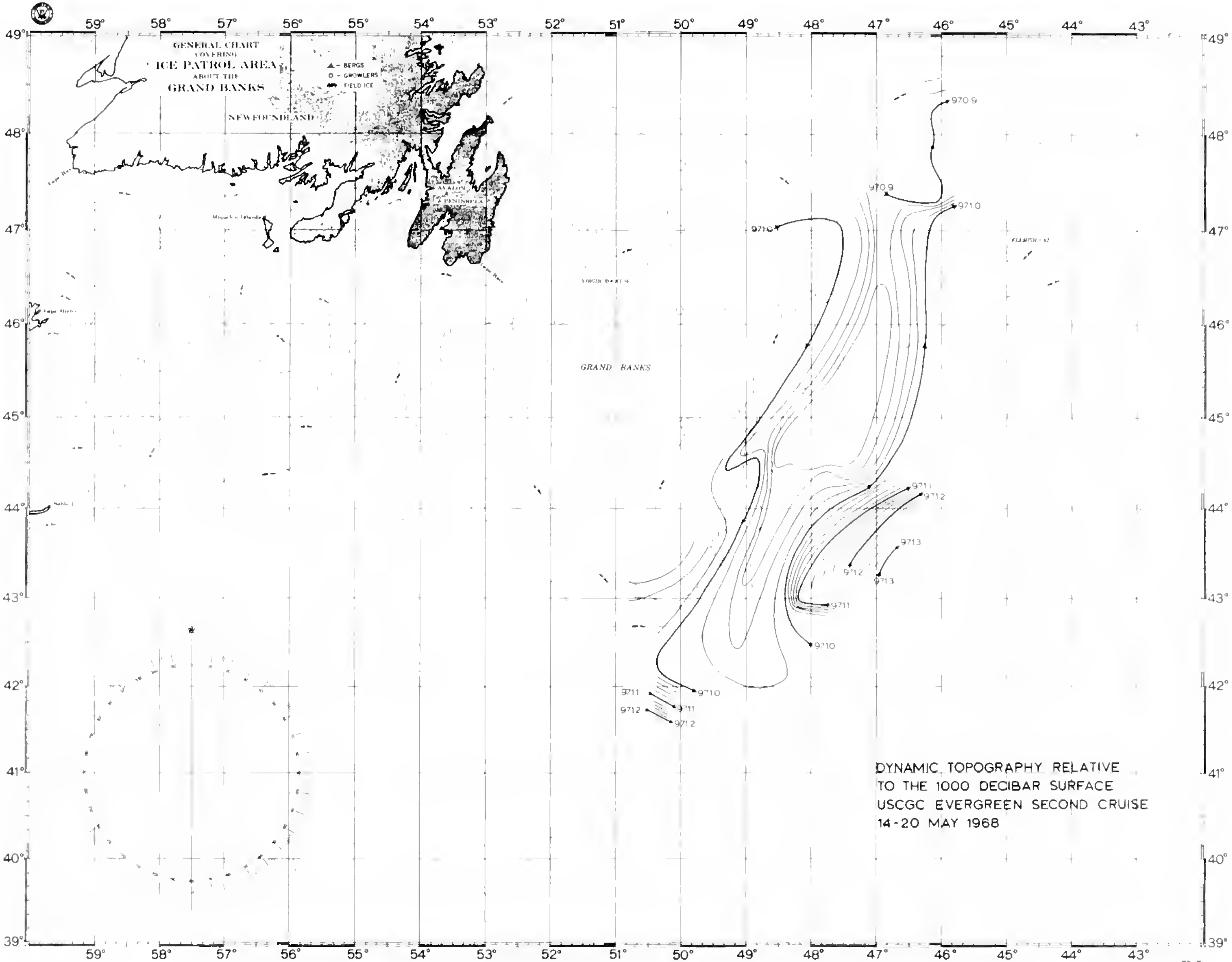


Figure 76.—Dynamic Topography, 14–20 May 1968.

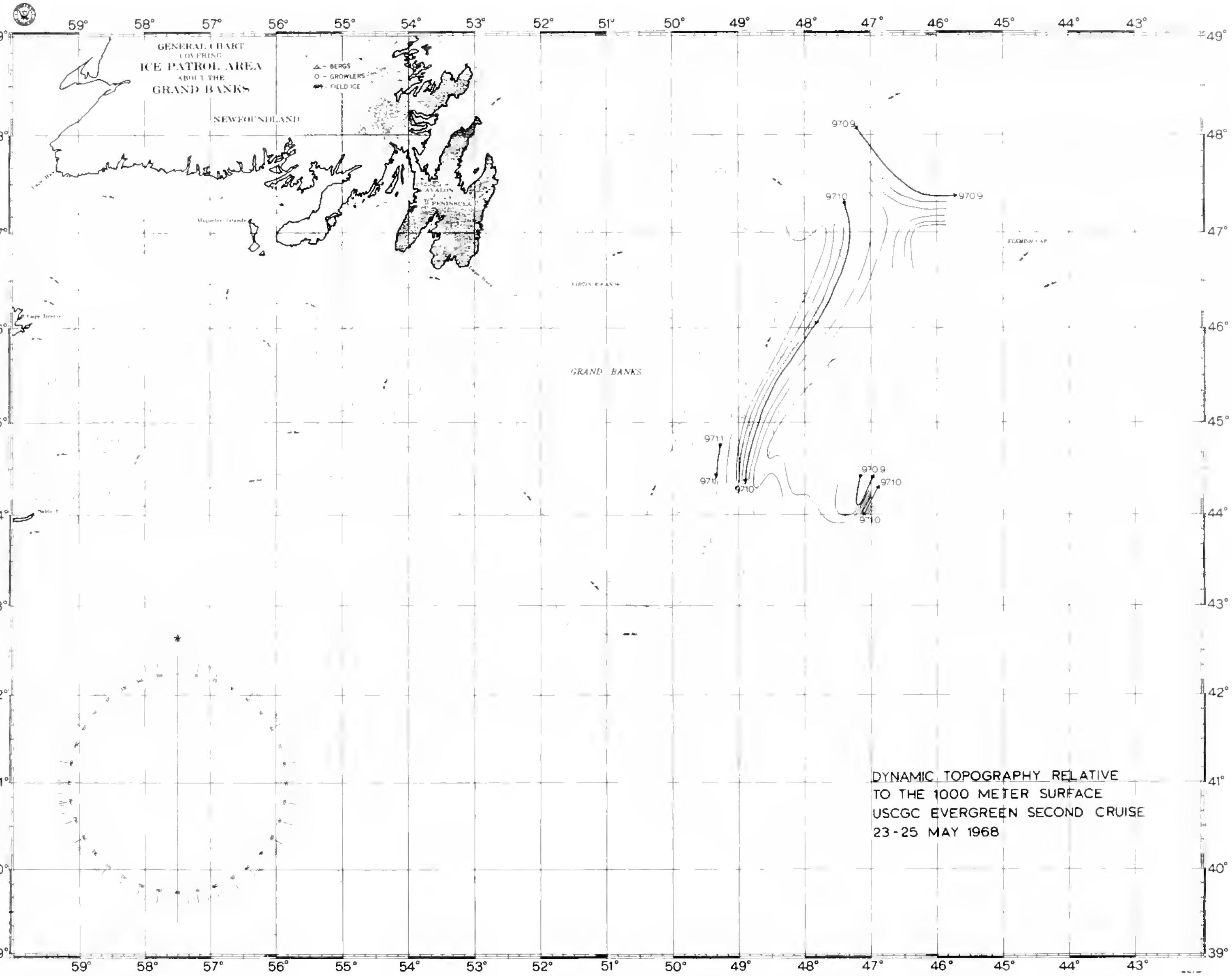


Figure 77.—Dynamic Topography, 23–25 May 1968.

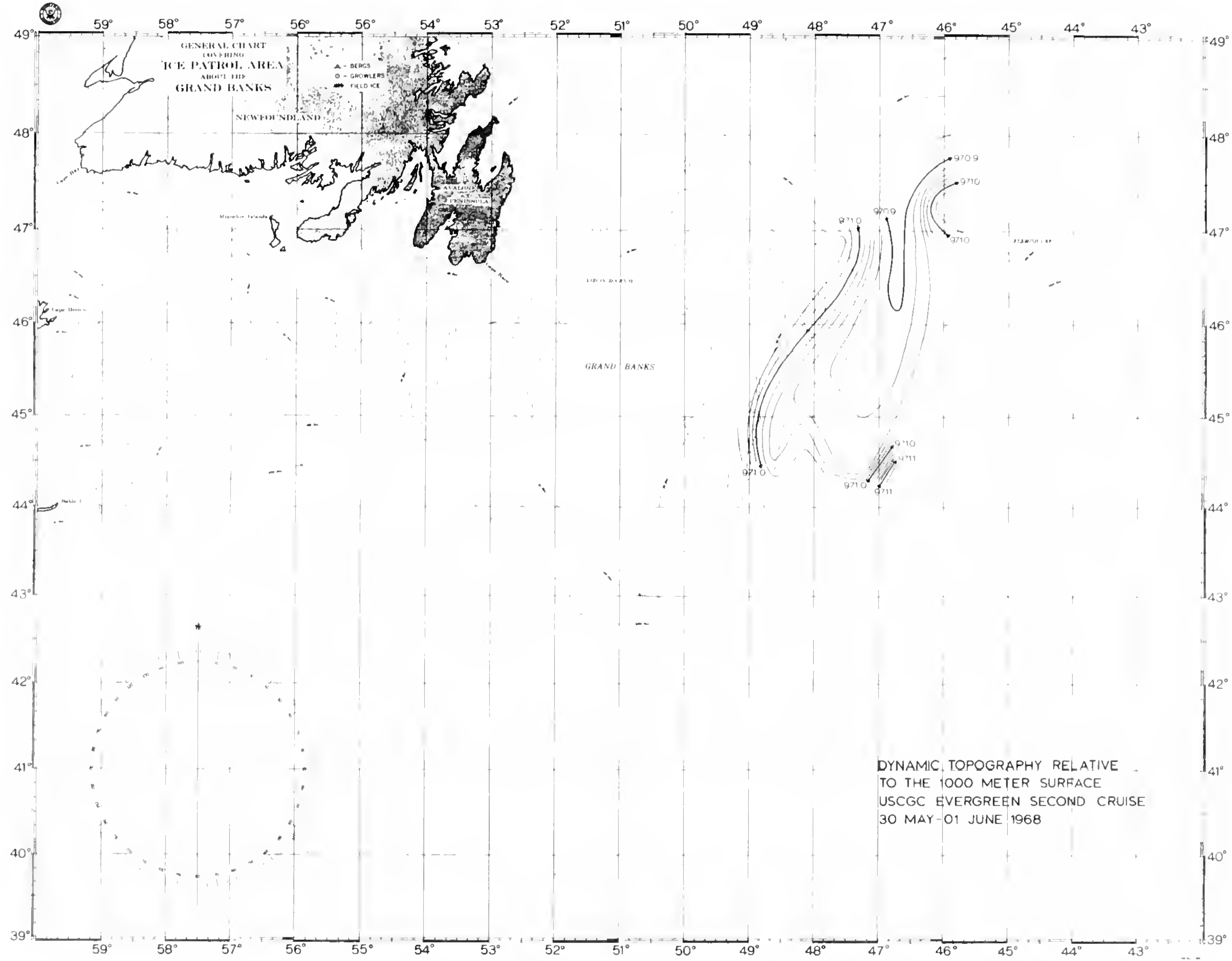


Figure 78.—Dynamic Topography, 30 May–1 June 1968.

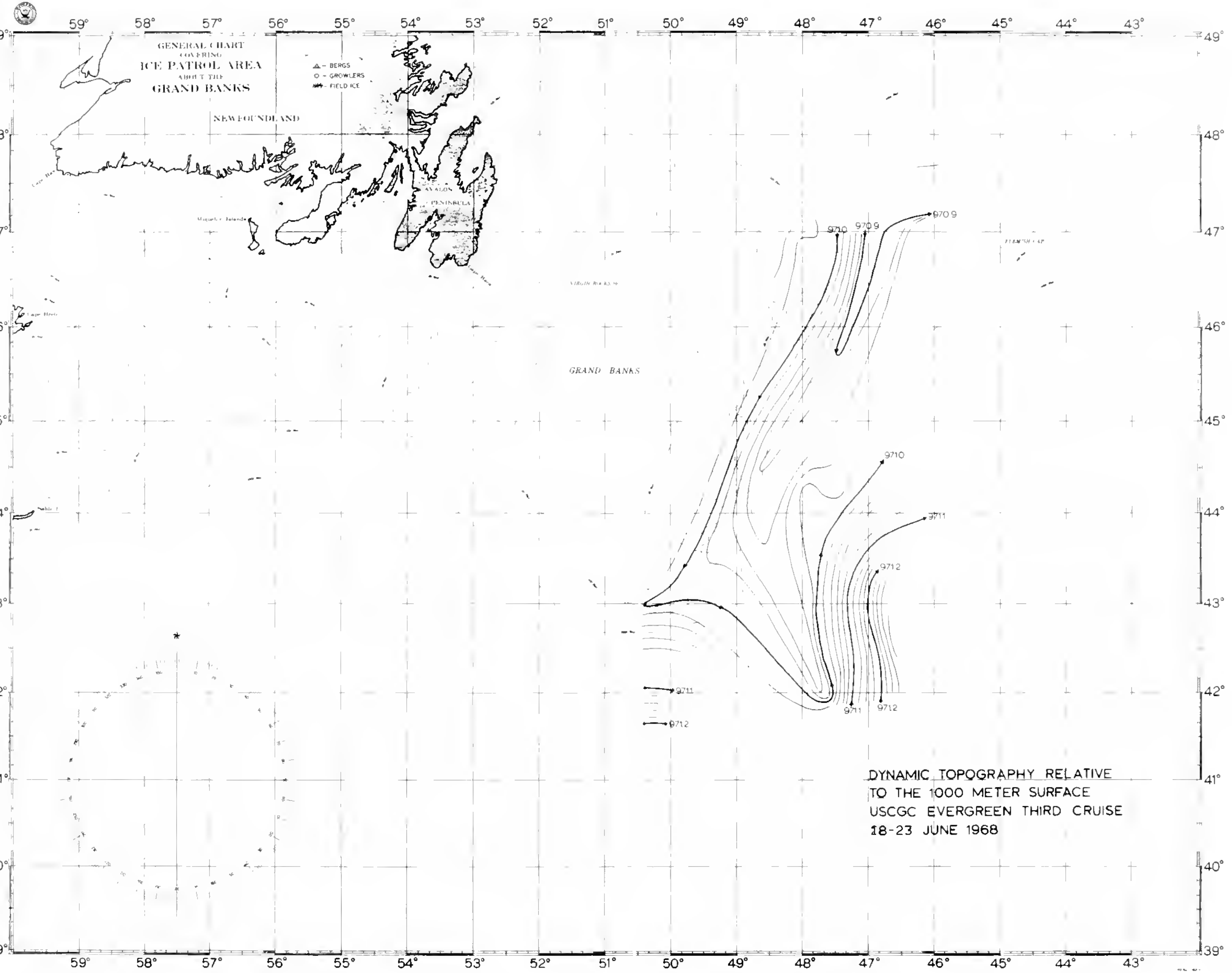


Figure 79.—**Dynamic Topography, 18–23 June 1968.**

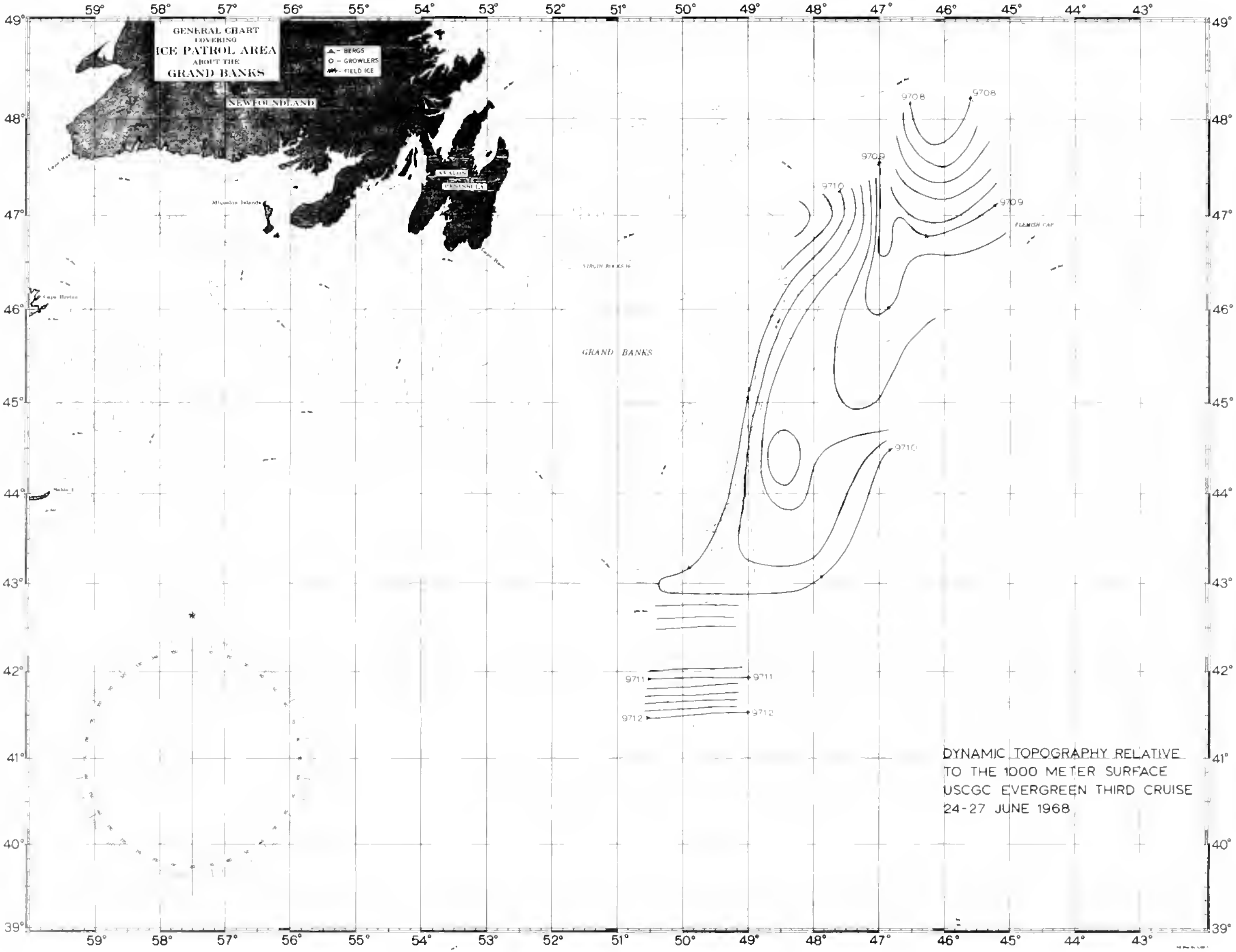


Figure 80.—Dynamic Topography, 24–27 June 1968.

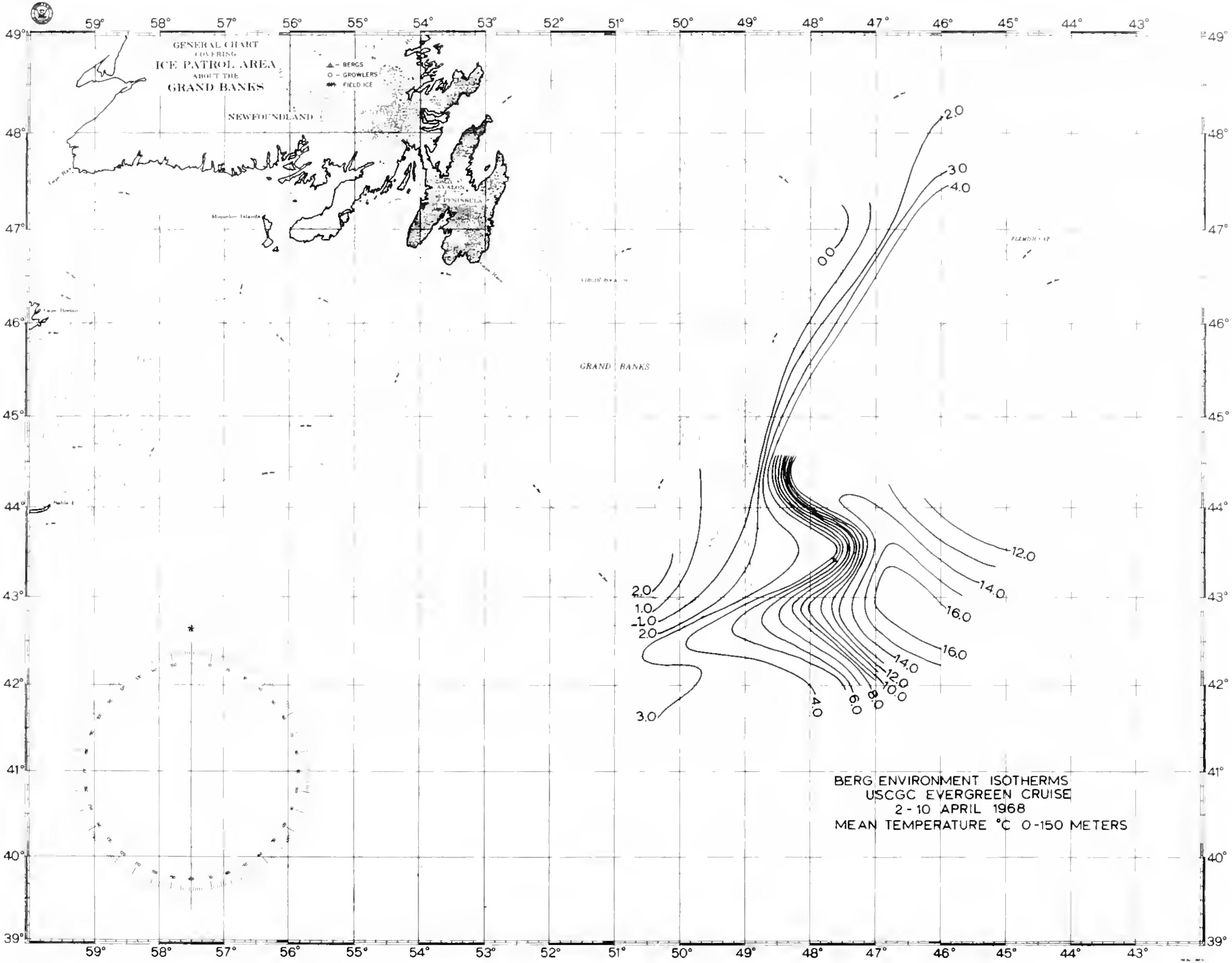


Figure 81.—**Berg Environment Isotherms, 2–10 April 1968.**

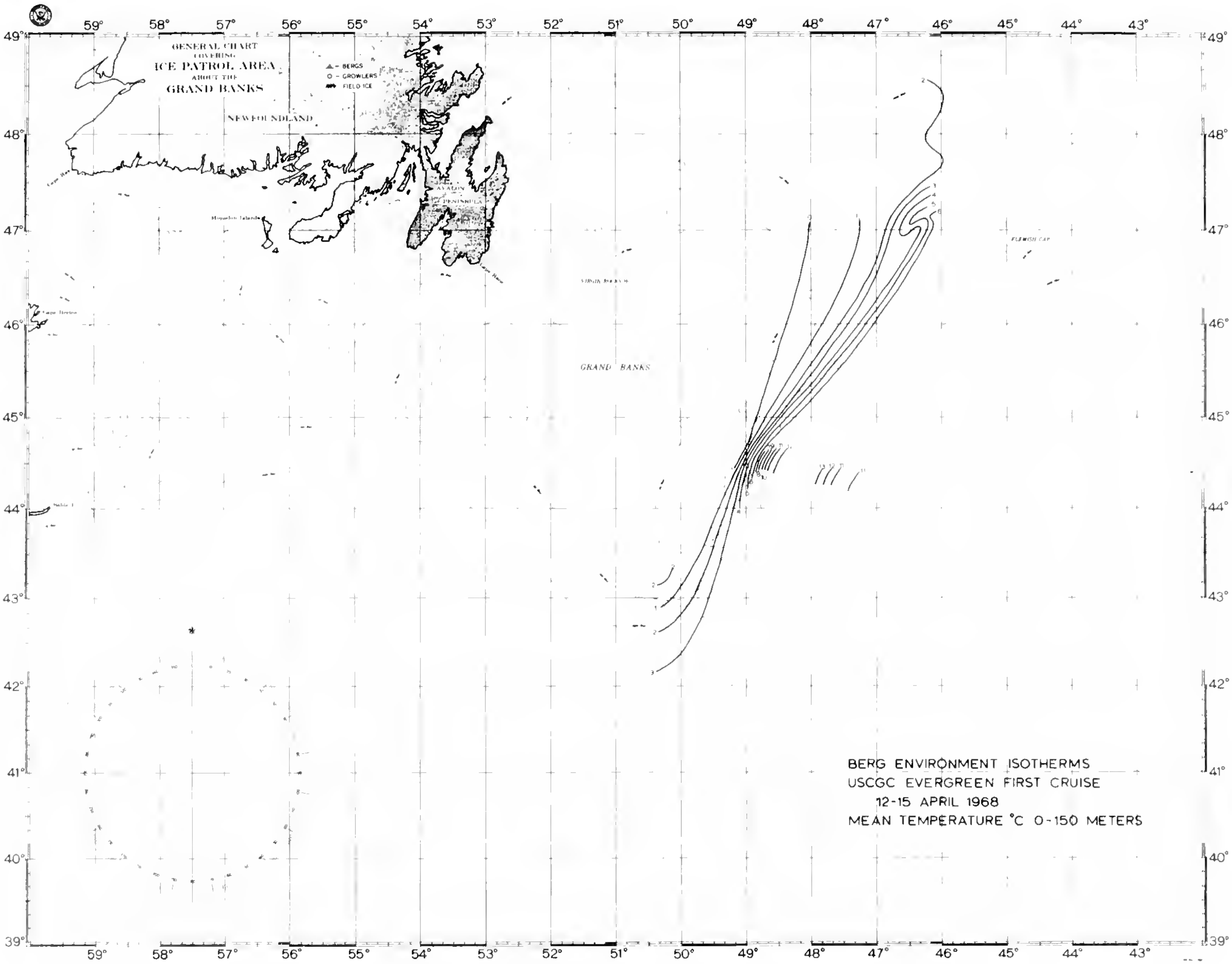
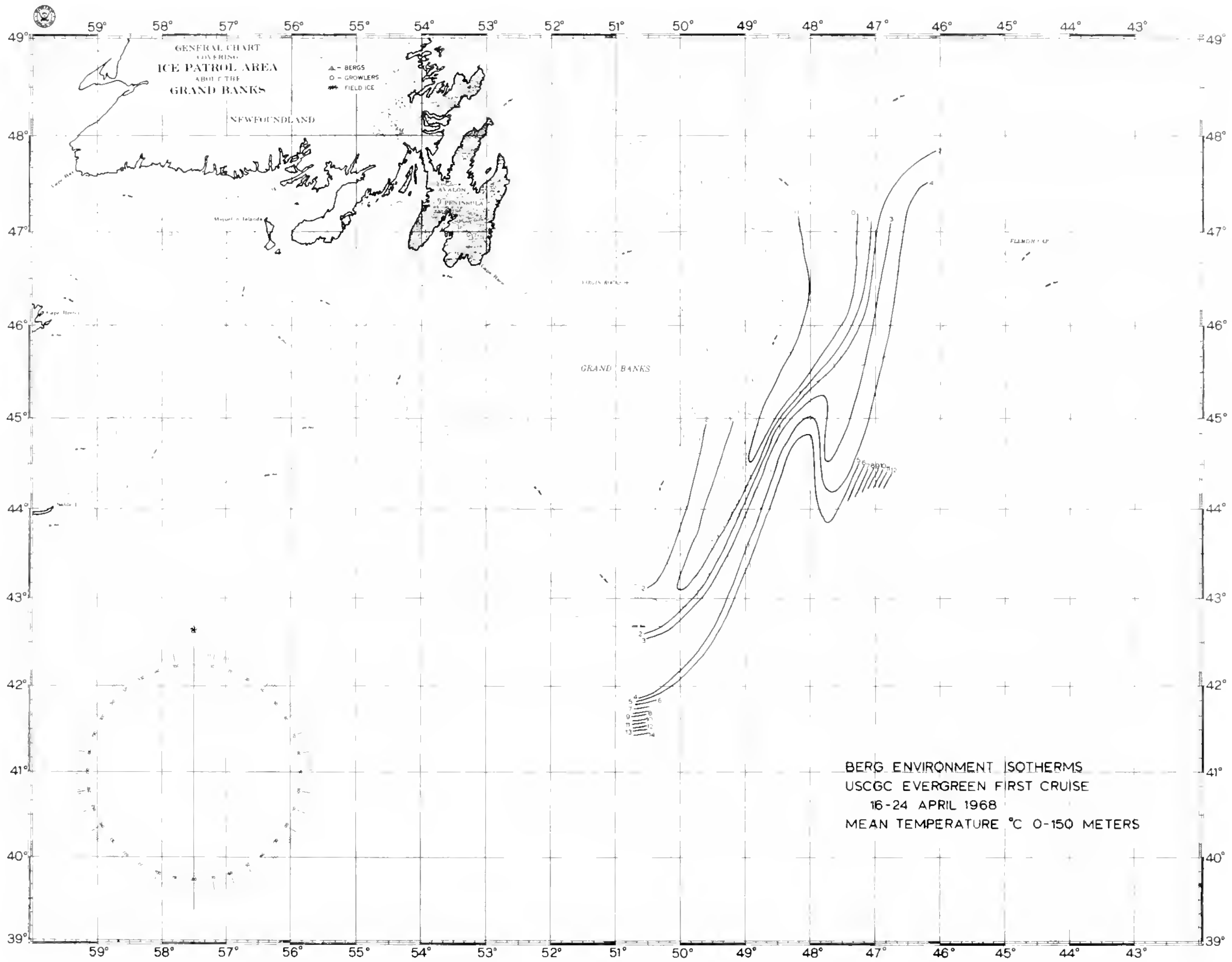


Figure 82.—Berg Environment Isotherms, 12–15 April 1968.



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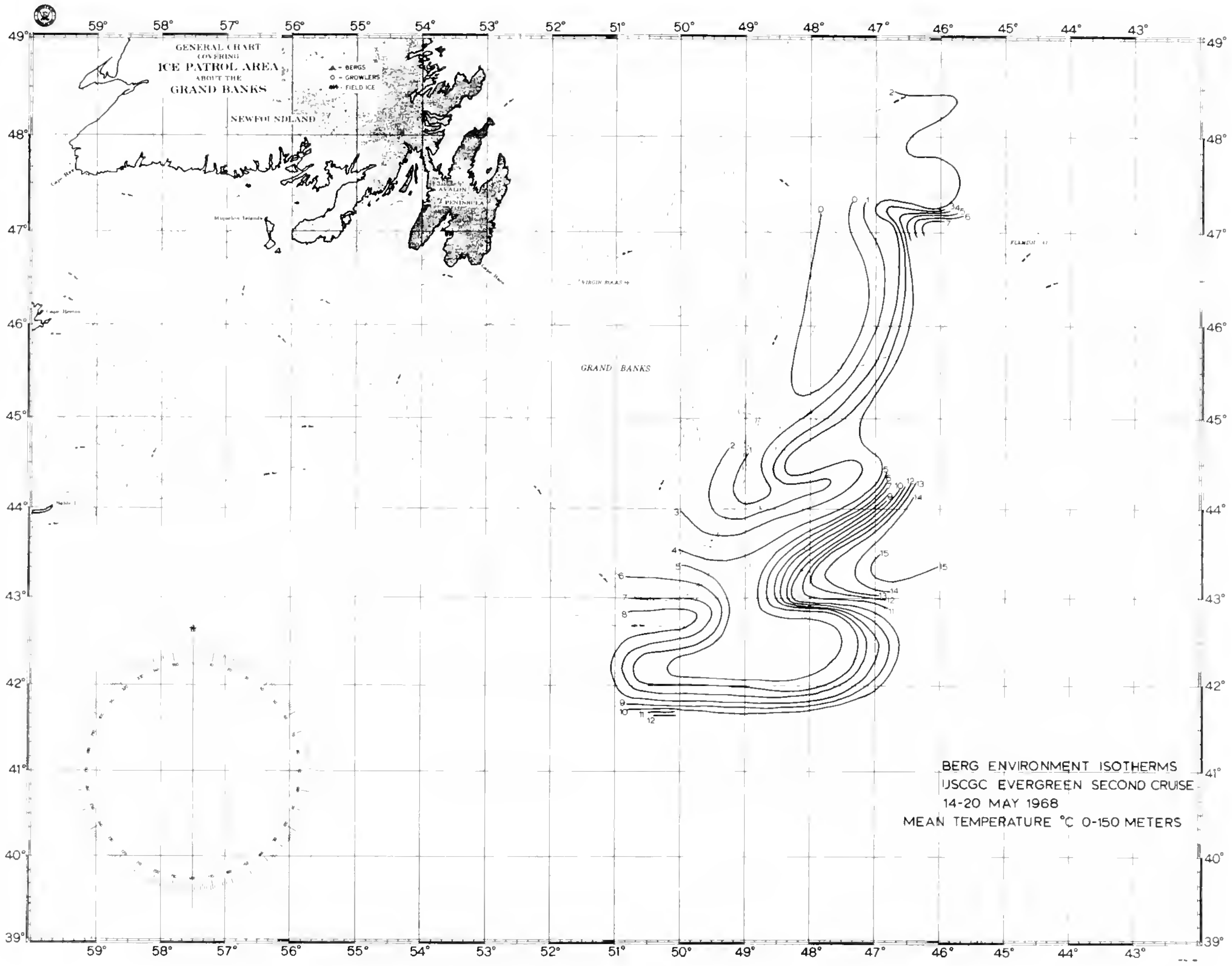
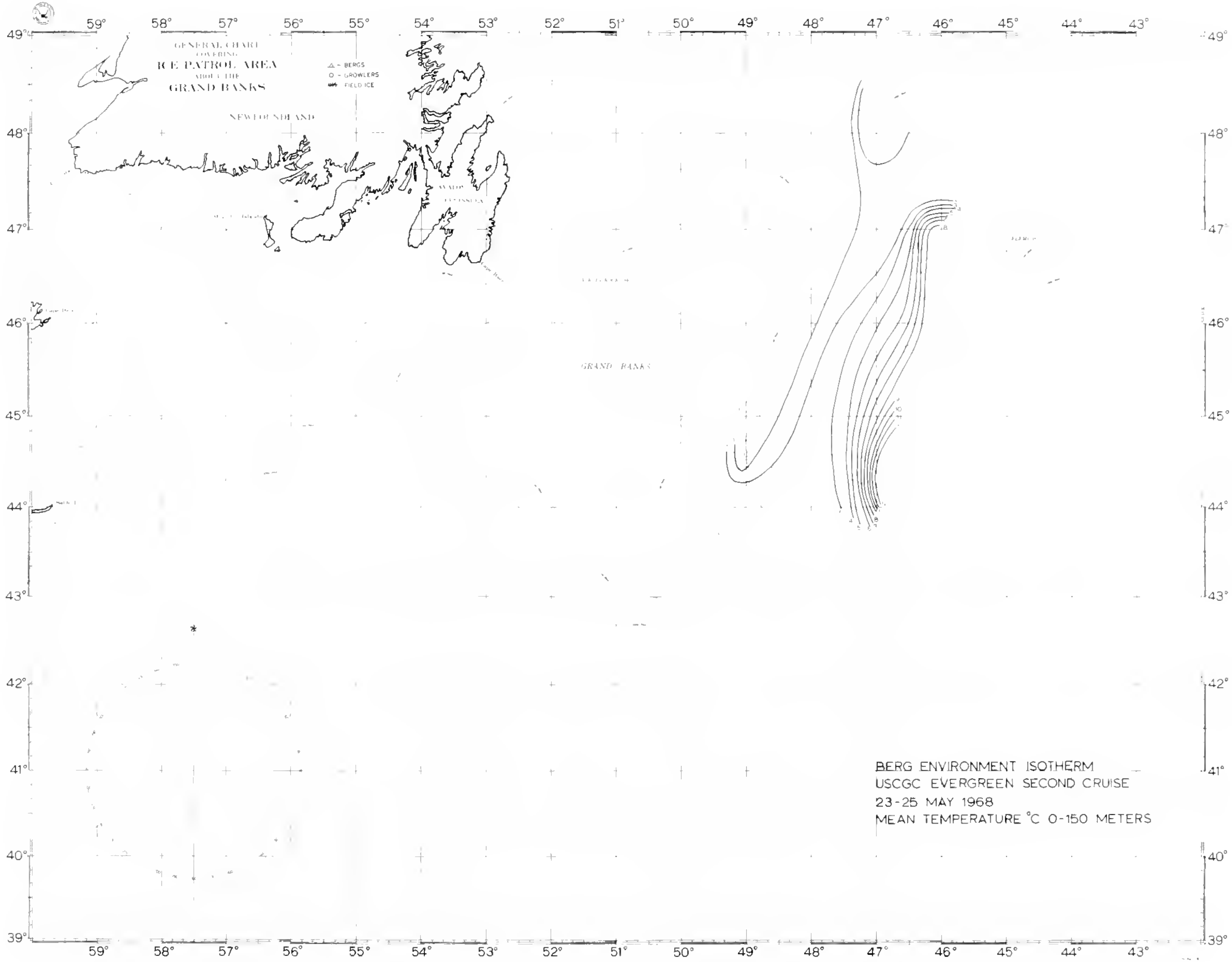


Figure 84.—**Berg Environment Isotherms, 14–20 May 1968.**



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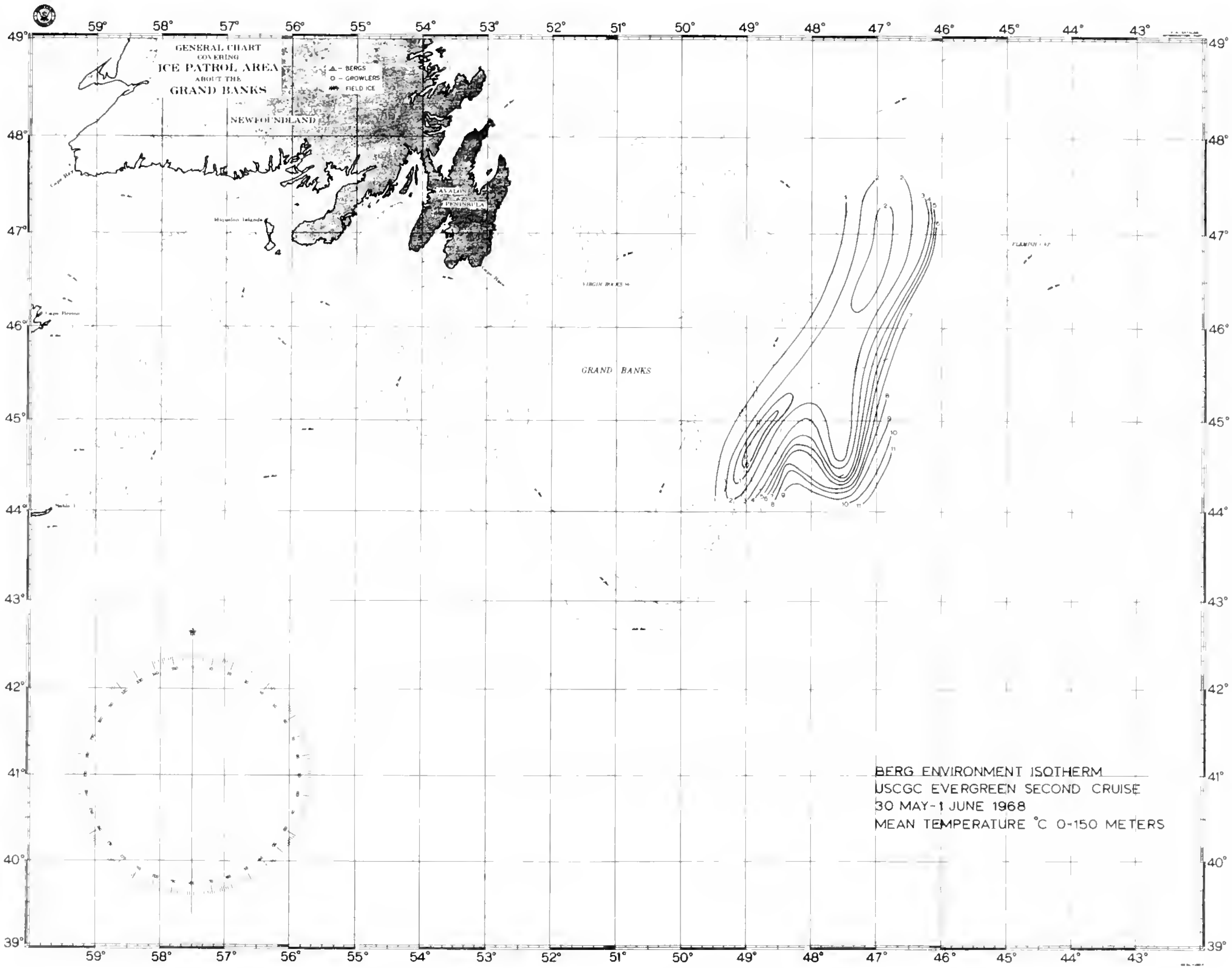

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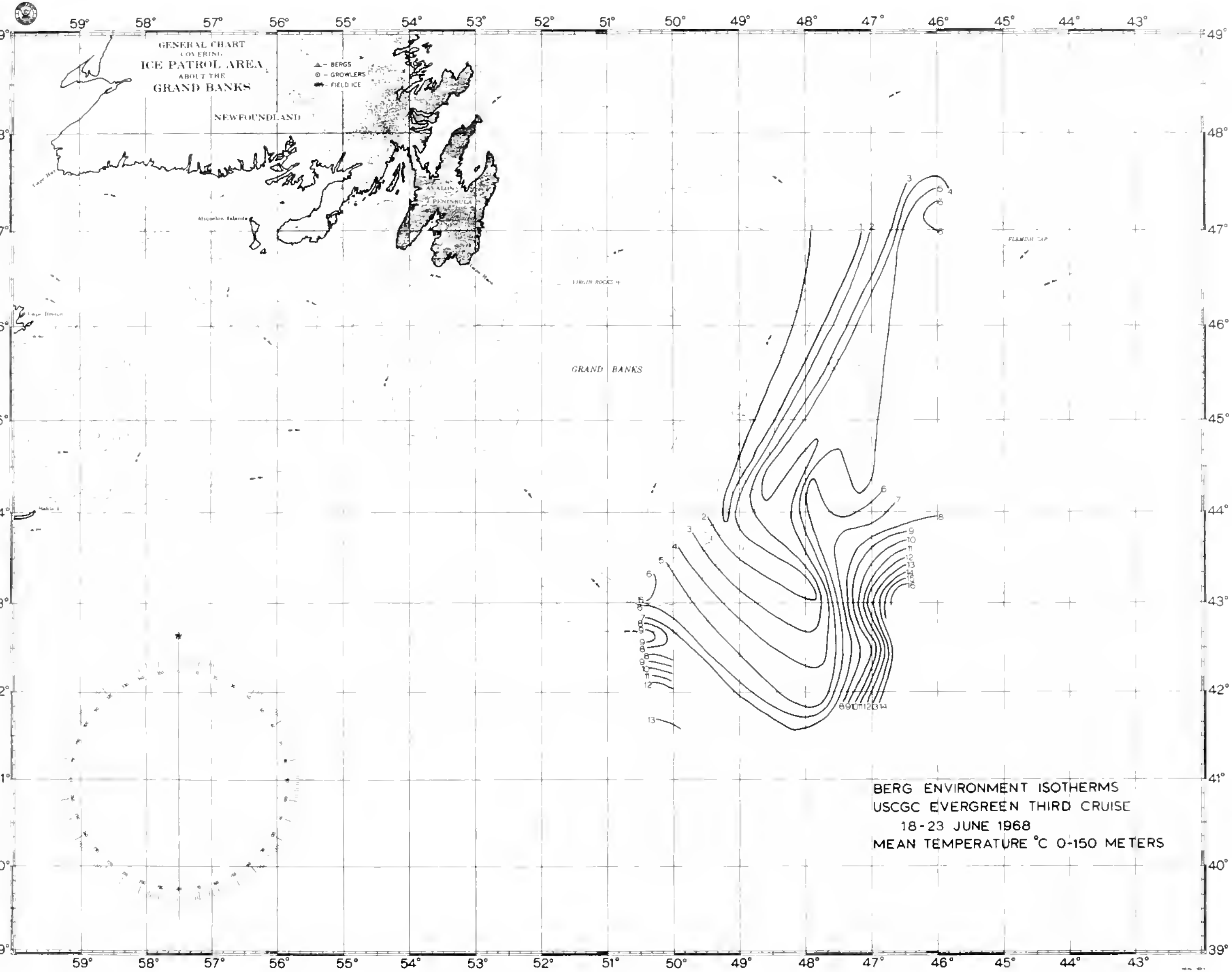

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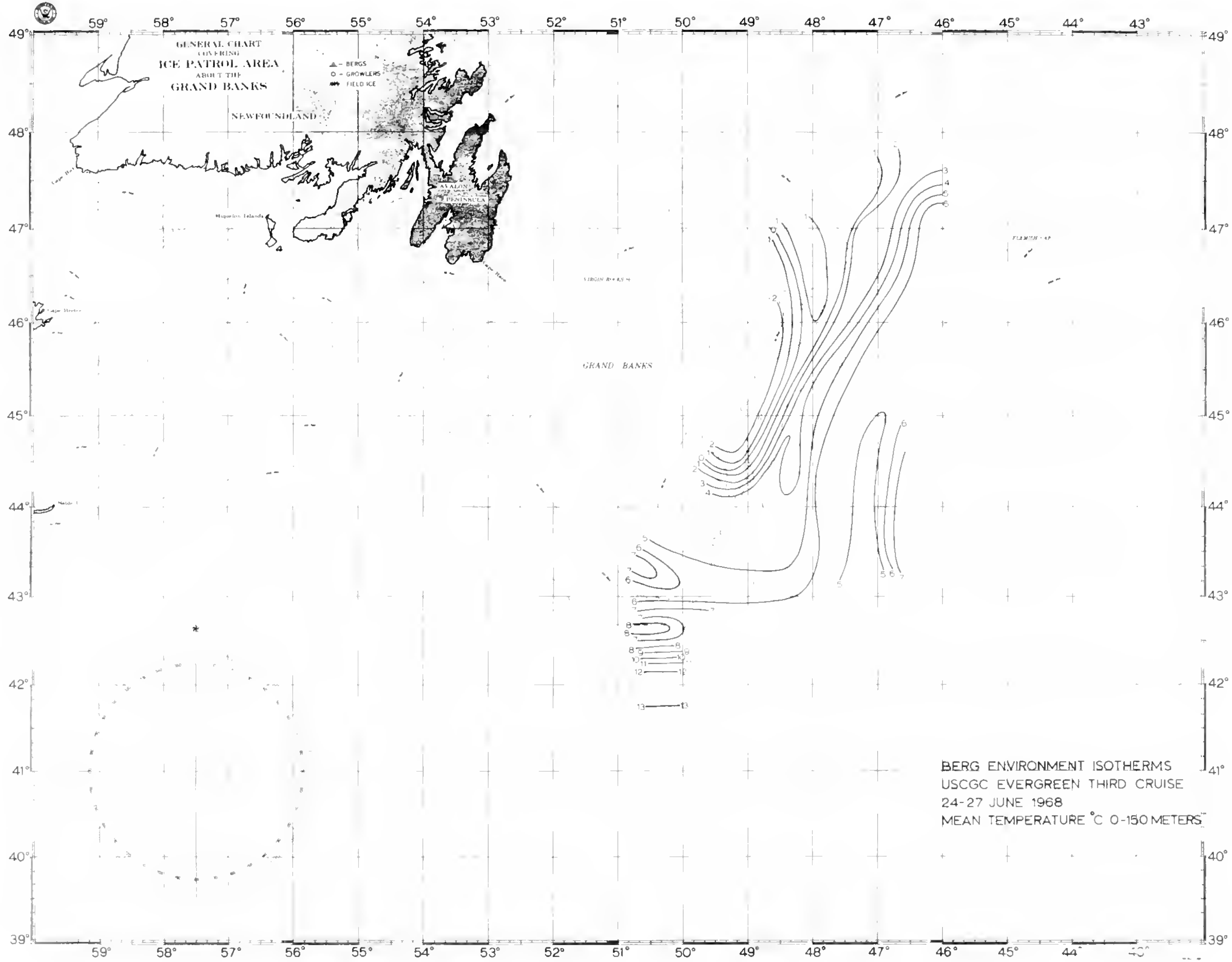

Figure 88.—Berg Environment Isotherms, 24–27 June 1968.

ICE AND WEATHER REPORTS

(By country)

Vessel	Weather Reports	Ice Reports
BELGIUM		
SS Breughel	8	3
SS Frubel Asia	5	
ONFP		1
SS Marchen	13	
CANADA		
SS Blue Cloud		2
SS Ontario Power		1
SS H 1070	1	1
SS Assiniboine		1
DENMARK		
SS Belgien		1
FINLAND		
SS Agneta	1	
SS Hansa		1
FRANCE		
SS Pinta		1
SS Commandant Bourdais	60	20
SS Chicago	9	
SS Longwy	3	5
SS Hebe	2	
SS Stigmaria	11	
SS France	45	
SS Cetra Columba		1
SS Eglantine	2	2
SS Ampere	7	7
SS Jean L. D.		1
GERMANY		
SS Alfred Theodor		1
SS Aldenburg	3	
SS Christiane Schulte	1	1
SS Emma Johanna		1
SS Frisia	3	1
SS Henriette Schulte	10	2
SS Ilse Schulte		1
SS Johannes Fritzen	8	1
SS Surwurdersand		1
SS DDLN		1
SS Berkershiem		1
SS Susanne Fritzen	11	
SS Conrad		1
SS Elizabeth Entz		1
SS Anna Rehder		1

Vessel	Weather Reports	Ice Reports
GERMANY—Cont.		
SS Naumburg	11	3
SS Weser		1
DGRI	1	1
SS Susanne Reith	3	
SS Hagen	4	
SS Magdenburg	30	3
SS Constantia	1	
SS Leada	1	1
SS Transpacific	6	1
SS Cursa		2
SS Elsfleth	5	5
SS Praunheim		3
SS Sirius	7	
SS Flensburg	1	1
SS Egon Wesch	1	
INDIA		
SS Maratha Progress	9	
IRELAND		
SS Irish Rose	2	2
SS Irish Plane	1	1
SS Atlantic Duke	1	
SS Marka L	1	
ITALY		
SS Stolt Avenir		1
SS Raffaello	7	
SS Cristoforo Columbo	7	
SS Leonardo Da Vinci	1	
SS Michelangelo	40	
SS Capo Mele	15	
JAPAN		
SS Manjusan Maru	7	2
SS Asama Maru	3	
SS Atlantic Maru	4	2
SS Takuyo Maru	1	
LIBERIA		
SS Ore Mercury	8	....
SS Joseph P. Grace	13	...
SS Oriental Challenger	4	.
SS Banasol	6	.
6ZZE		1
MEXICO		
XCMC	3	

Vessel	Weather Reports	Ice Reports
NETHERLANDS		
SS Acmaea	10	
SS Atlantic Star		1
SS Grotedyk	12	
SS Maasdam		1
SS Nieuw Amsterdam	3	3
SS Prinses Anna	5	2
SS Prinses Elilia		1
SS Stad Den Haag	3	
SS Statendam	1	2
PVGP		1
NIGERIA		
SS Nnamdi Azikiwe	6	
SS Herbert Macauley	15	1
NORWAY		
SS Skrim		1
SS Augvald		1
SS Favorita		1
SS Topdalsfjord		1
SS Sandviken	25	3
SS Sirefjell		1
SS Finse	5	1
SS Dea Brovig	2	
SS Wenny		2
SS Foldenfjord		1
SS Bergensfjord	37	3
SS Jalanta	3	
PANAMA		
SS Aristodimos	1	
POLAND		
SS Batory		1
SS Jantar	1	2
SWEDEN		
SS Nordia	3	
SS Britta		1
SS Laidaure		1
SS Bohus	8	
SS Maj Ragne	2	
SS Kungsholm	28	1
SS Lucssa	29	
SS Sagaholm		2
SS Laponia	39	2
SS Nebraska	6	
SS Gripsholm		1
UNION OF SOVIET SOCIALIST REPUBLICS		
SS Riga		1
SS Rambinas		1
SS Sarma		1
UIWH	1	1
UJYK		1
SS Kuibyshevges		1
SS Mikhail Lomonosov		1

Vessel	Weather Reports	Ice Reports
UNITED KINGDOM		
SS Alice Bowater	16	8
SS Manchester Faith	21	
SS Sunek	9	
SS Queen Elizabeth	1	
SS Santona	5	3
SS Bristol City	12	3
SS British Gannet	16	1
SS Mathura	8	
SS Manchester Fame	17	3
SS British Freedom	8	...
SS Phyllis Bowater	15	
SS Newfoundland	17	
SS Alaunia	4	
SS Bishopsgate	41	7
SS Aldersgate	1	2
SS St. Margaret	3	1
SS Nina Bowater	1	1
SS Empress of Canada	16	8
SS Phoinia	2	2
SS Cape Nelson		1
SS Dukesgarth	48	1
SS Salmela	5	2
SS Gosforth		3
GIGK	1	....
SS Beaverpine	11	2
SS Montreal City	24	
SS Beaver Elm	8	3
SS Welsh Herald	3	3
SS Beaver Ash	36	4
SS Manchester Commerce	12	
SS St. Keverne	1	1
SS Ivernia	13	...
SS Media	67	1
SS Parthia	14	2
SS Saxonia	12	1
SS Halifax City	5	
SS Orama	1	..
SS Scythia	39	3
SS Manchester City	7	
SS Roonagh Head	1	1
SS Sameria	32	1
SS Manchester Spinner	6	1
SS Framptondyke	1	1
SS Oswestry Grange	5	
SS Cairngowan	20	
SS Manchester Exporter	2	3
SS Sheaf Mount	6	1
SS Victory		2
SS Atherstone	9	2
SS Duhallow	8	
SS Silver Beach	5	
SS Coventry City	6	
SS Toronto City	4	
SS Rathlin Head	2	2
SS Oredian	18	
SS Beaver Oak	1	....
GRQN	2	1
Manchester Port	9	1
SS Gloucester City	10	....

Vessel	Weather Reports	Ice Reports
UNITED KINGDOM—Cont.		
SS William Hardy	1	3
SS Manchester Trader	14	
SS Setia	16	
SS Manchester Progress	3	1
SS Anatolian		1
SS Southern Prince	59	4
SS Bolnes	5	
SS Dunadd		1
SS Duncraig	9	2
SS Swanella		1
SS Empress of England	38	8
SS Afghanistan	31	2
SS Trinculo		2
SS Sagamore	2	2
SS Naess Trader	1	1
SS Otaio	13	1
SS Pennyworth	2	2
SS Montcalm	6	
SS Manchester Freighter	20	2
SS Silver Craig		1
SS Manchester Miller	27	2
SS Manchester Shipper	19	7
SS Velletia	3	
SS Fair Head		1
SS Iron Barque	6	3
SS Iron Horse		1
SS Iron Crown		1
SS Edenmore	1	1
SS Sir Andrew Duncan		3
SS Caxton		2
UNITED STATES OF AMERICA		
SS Exiria	13	
SS Biddeford Victory	1	
SS American Importer	48	
SS American Merchant	5	
SS American Scout	17	
SS American Veteran	4	
SS Admiral Callagam	48	
SS American Reliance	21	

Vessel	Weather Reports	Ice Reports
UNITED STATES OF AMERICA—Cont.		
SS American Rover	31	
KNMH	11	
SS Container Despatch	1	
SS Santa Monica	2	
SS Texas Clipper	3	
SS Bay State	1	1
SS Mormacvega	9	
SS Mormacdrago	24	
WTKL	3	
UNITED STATES OF AMERICA—GOVERNMENT		
UNITED STATES COAST GUARD		
U.S.C.G.C. Chincoteague	29	2
U.S.C.G.C. Halfmoon	20	3
U.S.C.GC. Castle Rock	12	2
U.S.C.G.C. Humboldt	3	2
U.S.C.G.C. Vigilant	1	
U.S.C.G.C. Casco	9	
U.S.C.G.C. Edisto	16	4
U.S.C.G.C. Chase	1	
U.S.C.G.C. Escanaba	17	1
U.S.C.G.C. Hamilton	21	
U.S.C.G.C. McGulloch	21	1
U.S.C.G.C. Dallas	16	
U.S.C.G.C. Spencer	18	
U.S.C.G.C. Sebago	2	
U.S.C.G.C. Evergreen	303	14
U.S.C.G.C. Cook Inlet	48	9
U.S.N.S.		
U.S.N.S. Marine Fiddler	8	
YUGOSLAVIA		
SS Kupres	2	
SS Bosanka	10	1
SS Makarska	5	

☆ U.S. GOVERNMENT PRINTING OFFICE 1969 O—354-714

COAST GUARD

BULLETIN NO. 55

Report of the International Ice Patrol Service in the North Atlantic Ocean

SEASON OF 1969

CG–188–24

DEPARTMENT OF TRANSPORTATION

UNITED STATES COAST GUARD

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U.S. COAST GUARD
WASHINGTON, D.C.
20591

31 December 1969

Transmitted herewith is Bulletin No. 55, Report of the International Ice Patrol Service in the North Atlantic Ocean, Season of 1969.

R. W. GOEHRING,
Chief, Office of Operations.

Dist: (SDL No. 89)
A: abdfghmuv(1)
B: b(50 CEA, 5 CWA), e(10), egq(2), mn(1)
C: abc(1)
D: s(35), i(2), lux(1)
E: None
F: None
SML: 133

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PREFACE

This Bulletin is No. 55 in a series of annual reports on the International Ice Patrol Service in the North Atlantic Ocean. The authority for the service is contained in the United States Code, Title 46, Sections 738, 738a through 738d, and the International Convention for the Safety of Life at Sea, 1960. This Bulletin presents information on Ice Patrol organization and operations as well as on communications, ice conditions, and climatology.

Rear Admiral Mark A. WHALEN, USCG, was Commander, International Ice Patrol. Commander James R. KELLY, USCG, was directly responsible for the management of the patrol.

The authors of this Bulletin, Commander James R. KELLY, USCG, and Lieutenant Commander Charles W. MORGAN, USCG, acknowledge ice data supplied by the Canadian Department of Transport Ice Central, Halifax, and meteorological data furnished by the Canadian Department of Transport Meteorological Branch and the U.S. Department of Commerce National Meteorological Center. The assistance of Yeoman First Class Heber M. KERN, USCG, Marine Science Technician Second Class John A. THAW, USCG, and Marine Science Technician Third Class Mahlon N. ROBINSON, USCG, in the preparation of the manuscript and illustrations for this Bulletin is also acknowledged.

INTERNATIONAL ICE PATROL, 1969

The 1969 International Ice Patrol Service in the North Atlantic Ocean was conducted by the U.S. Coast Guard under the provisions of the United States Code, Title 46, Sections 738, 738a through 738d, and the International Convention for the Safety of Life at Sea, 1960. Commander, International Ice Patrol collected ice information from all available sources and disseminated it during the ice season by means of twice daily bulletins and radio broadcasts, daily radio facsimile charts, and in response to special requests.

Commander, International Ice Patrol directed the Ice Patrol from offices located on U.S. Coast Guard Base, Governors Island, New York. The Ice Patrol aircraft and crew deployed to U.S. Naval Station Argentia with ice observers, additional radiomen for the Ice Patrol radio station (NIK), and other support personnel on 12 March 1969. U.S. Coast Guard Radio Station Argentia (NJN) assumed duties as Ice Patrol Radio Station (NIK) at 0018 G.m.t. on 15 March 1969 when the ice season officially opened with the first Ice Broadcast. Ice Patrol Radio Station (NIK) transmitted twice daily ice broadcasts and daily ice radio facsimile charts throughout the ice season. During the ice season USCGC *Chincoteague*, commanded by Commander Thomas T. WETMORE III, USCG, and USCGC *Cook Inlet*, commanded by Commander Richard K. SIMONDS, USCG, conducted oceanographic surveys of the Grand Banks in support of the International Ice Patrol. A surface patrol vessel was assigned, but for the 10th consecutive year it was unnecessary to utilize it. The Ice Patrol Office on Governors Island gathered ice and environmental reports from various sources, maintained an ice plot, forecast ice conditions, prepared the ice bulletins, broadcasts, and facsimile instructions, and answered special requests for ice information. The ice season lasted 123 days, terminating on 16 July with the 0018 G.m.t. Ice Broadcast. Ice Patrol forces returned from Argentia on 16 July 1969.

AERIAL ICE RECONNAISSANCE

Commander, International Ice Patrol conducted 19 pre-season flights between September 1968 and the beginning of the ice season in March 1969 for the purpose of determining the concentration of ice in Baffin Bay and along the Labrador coast. Ice Patrol aircraft, Lockheed Hercules HC 130 B, flew 66 ice observation patrols during the ice season between 15 March and 16 July 1969. While these patrols concentrated primarily on the area of the Grand Banks, some extended as far north as Cape Chidley, Labrador, for the purpose of gauging the potential severity of the ice season as it progressed. Following the conclusion of the ice season, six ice reconnaissance patrols were flown in August 1969 to insure that the shipping lanes in the vicinity of the Grand Banks remained ice free. Ice Patrol aircraft navigated primarily by means of Loran A and Airborne Doppler Navigation, and made use of aircraft radar to aid in fixing the position of ice, especially during periods of low visibility. Air crews used a microwave radiometer to assist in identifying radar targets under conditions of poor visibility. Table 1 presents flight statistics for the period September 1968 through August 1969.

***Table 1.*—Aerial Ice Reconnaissance Statistics—September 1968 through August 1969.**

Month	Number of flights	Flight hours
Sep	4	29. 5
Oct	3	20. 8
Nov	0	0
Dec	3	15. 9
Jan	2	12. 1
Feb	3	19. 0
Mar	13	72. 4
Apr	14	78. 6
May	14	80. 5
Jun	21	120. 5
Jul	8	50. 2
Aug	6	43. 3
Total	91	542. 8

COMMUNICATIONS

Ice Patrol communications included reports of ice and environmental conditions, ice bulletins, ice broadcasts, fascimile charts, and administrative traffic necessary to operate the patrol. The Ice Bulletin was disseminated by teletype from the Ice Patrol office to a number of organizations, including the U.S. Navy, the Canadian Department of Transport, and the Canadian Armed Forces. Some of the ice bulletins were re-broadcast by U.S. Naval Station Radio Washington (NSS) and Canadian Maritime Command Radio Station (CFH).

Tables 2 and 3 present Ice Patrol communications statistics for the period September 1968 through August 1969.

Ice Patrol Radio Station (NIK) transmitted the Ice Broadcast to shipping daily at 0018 and 1218 G.m.t. Each transmission was preceded by the call CQ on 500 kHz with instructions to shift to 427, 5320, 8502 or 12880.5 kHz to receive the Ice Broadcast. After a two-minute series of test signals transmitted on the operating frequencies given above, NIK transmitted the Ice Broadcast, first at 25 words per minute, and then at 15 words per minute. Ice Patrol Radio Station (NIK) also transmitted a facsimile chart of ice conditions at 1330 G.m.t. daily on 5320, 8502, and 12880.5 kHz with a drum speed of 60 r.p.m. For general radio communications with merchant shipping, NIK used duplex operation. Merchant shipping, after calling on 500 kHz, or the 8 or 12 mHz maritime calling bands, shifted to their working frequency and NIK worked on 427, 8650, or 12889.5 kHz.

***Table 2.*—Communications Statistics**

Number of ice reports received from ships	139
Number of ships furnishing ice reports	33
Number of sea surface temperature reports	1985
Number of ships furnishing sea surface temperature	211
Number of ships requesting special information	11
Number of NIK Ice Broadcasts	246
Number of NIK FAX Broadcasts	123

***Table 3.*—Percentage Distribution by Nationality of Ships furnishing Ice or Sea Surface Temperature Reports**

United Kingdom	29. 3
United States of America	16. 9
Federal Republic of Germany	11. 2
Norway	7. 3
Liberia	6. 8
France	5. 6
Sweden	3. 4
Belgium	2. 3
Italy	2. 3
Canada	1. 7
Netherlands	1. 7
Union of Soviet Socialist Republics	1. 7
Denmark	1. 1
Iceland	1. 1
Israel	1. 1
Switzerland	1. 1
Cuba	. 6
Finland	. 6
Greece	. 6
Japan	. 6
Poland	. 6
Spain	. 6
Turkey	. 6
Yugoslavia	. 6
New Zealand	. 6

OCEANOGRAPHIC OPERATIONS

Two oceanographic cruises were conducted in support of the International Ice Patrol during the 1969 ice season. The oceanographic information that was collected was used to forecast the drift of ice. The U.S. Coast Guard Cutters *Chincoteague* and *Cook Inlet* conducted these oceanographic operations during the periods 2–28 April 1969 and 14 May to 9 June 1969 respectively.

The oceanographic data collected on the two cruises revealed, under preliminary operational analysis, that the current structure of the Grand Banks did not vary greatly from the normal However, water temperatures appeared generally warmer than normal. For a detailed discussion of the oceanography of the region of the Grand Banks during the 1969 ice season, refer to the appropriate USCG Oceanographic Report (CG 373 series).

ICE CONDITIONS AND THE ENVIRONMENT

During the period 1 September 1968 to 30 August 1969 an estimated total of 57 icebergs drifted south of 48° N. Table 4 shows the monthly statistics for this period.

Preseason aerial ice reconnaissance of Baffin Bay in late September and early October of 1968 indicated the possibility of a heavy ice season on the Grand Banks in the spring of 1969. Figure 1 shows the distribution of approximately 10,000 icebergs observed during the reconnaissance. Except for the areas along the Greenland coast and between Greenland and Ellesmere Island, the counts indicated on Figure 1 are probably accurate within ±10 percent. In areas along the Greenland coast and between Greenland and Ellesmere Island, the berg count could be low by up to 100 percent because of inaccuracies in the method of visually sampling and estimating counts. About 5,000 icebergs were counted in these two areas, however there may actually have been up to 10,000 icebergs. Allowing these assumptions, a total of up to 15,000 icebergs could have been present in Baffin Bay during the survey. The figure 15,000 is in general agreement with that obtained on the complete surveys made in 1948 and 1949. No significant amounts of sea ice were observed on the survey.

Some indication of the movement of icebergs out of Baffin Bay is shown in Figure 2 which presents smoothed contours of iceberg density (icebergs per square mile) on the September/October 1968 survey. As can be seen in the figure, four general paths of iceberg movement appear to be; (1) southwestward from the Disko Bay area, (2) westward from the Unamak Fjord area, (3) southwestward from eastern Melville Bay, and (4) westward along the Greenland coast from western Melville Bay and the Thule area until the Canadian coast is reached where the icebergs move southward. These paths are shown on Figure 2 by the letters A, B, C, and D respectively. These paths are in general agreement with previously reported ideas of iceberg movement and ocean currents.

Figures 3 through 6 show the development of the ice season, as observed on preseason surveys. The purpose of these preseason surveys was to both guard against the possibility of an undetected intrusion of icebergs into the Transatlantic shipping lanes, and to collect data on iceberg distribution. The iceberg distribution observed during the flights of 19–21 February (Figure 5), confirmed the growing belief that the expected heavy ice season would not be forthcoming. On 26 February 1969 Commander, International Ice Patrol disseminated a special ice bulletin wherein a light ice season, with less than 100 icebergs drifting south of 48° N., was forecast.

The development of the ice season after the commencement of Ice Patrol services on 15 March 1969 is shown in Figures 7 through 13. Figures 14 and 15 show the observations made on a series of postseason flights in August 1969. In general the m ment of icebergs during the season appeared to follow the normal paths. The number of icebergs drifting south of 48° N. was less than normal. Fifty-seven icebergs drifted south of 48° N. in 1969 versus a 24-year average (1946–1969) of 222 icebergs. The southernmost extent of icebergs this year, 43°50′ N., was about the same as the 1945–1965 average of 43°36′ N. The southernmost extent of sea ice to about 48°30′ N., 50°30′ W.

***Table 4.*—Estimated Number of Icebergs South of Latitude 48° N, 1969**

Season	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Total
1969	4	0	0	0	0	0	0	0	35	17	1	0	57
Average 1900–1945	5. 3	2. 3	2. 3	1. 7	2. 6	9. 8	45. 7	105. 3	154. 0	76. 5	26. 0	8. 4	440
Average 1946–1969	. 2	. 1	. 2	. 2	. 4	3. 6	24. 4	82. 0	62. 7	39. 6	9. 3	. 5	222
Average 1900–1969	3. 6	1. 6	1. 6	1. 2	1. 9	7. 2	38. 4	97. 3	122. 7	63. 9	20. 3	5. 7	366

NOTE.—Complete statistics for the period 1900 to 1968 are given in Report of the International Ice Patrol Service in the North Atlantic Ocean, Season of 1968 (CG 188–23).

occurred in the first week of May, as shown approximately in Figure 8, and was about 250 miles north of the average southernmost extent. By 20 May sea ice retreated northward somewhat, and the sea ice south of Belle Isle Strait separated from the main pack along the Labrador coast, thus forming a patch of sea ice which remained off the northeast coast of Newfoundland in the Notre Dame Bay area until early June when it finally disappeared. The first iceberg confirmed to have crossed 48° N. was reported 9 May in position 47°55′ N., 46°50′ W., as indicated in Figure 8. The easternmost reported penetration of an iceberg was to 46°30′ W. on 24 May. This report, from a ship, is shown on Figure 9. The southernmost iceberg penetration reported this season is shown on Figure 12. This was a radar target which was identified as an iceberg by airborne microwave radiometer in position 43°50′ N., 50°05′ W. on 20 June. Undoubtedly these southernmost and easternmost reported icebergs may have drifted somewhat further south and east before they disintegrated. On 28 June there was an unconfirmed report of a growler at 42°20′ N., 44°50′ W. There was also a ship report of a small iceberg at 41°10′ N., 52°10′ W. on 1 April. Extensive aerial reconnaissance of the area of this report revealed no iceberg and it was concluded that this report was almost certainly an incorrect identification.

One of the most interesting features of the 1969 iceberg season was the failure of the expected heavy ice season to materialize. In view of the large number of icebergs observed on the September/October 1968 survey, more than the average number of icebergs had been expected to drift south of 48° N. As it turned out there were significantly fewer than average icebergs south of 48° N. in 1969. The weather along the path of iceberg drift in the winter appears to be the predominant factor influencing the survival of icebergs to the shipping lanes in the vicinity of the Grand Banks. Figure 16, which presents the normal, and the 1968–1969 average monthly surface pressure in the iceberg areas, shows qualitatively why the heavy ice season did not materialize. Assuming that the wind effect on icebergs is such that they will drift somewhat to the right of the geostrophic wind, Figure 16 shows that generally the 1968–1969 pressure patterns were somewhat less favorable than normal for the southward drift of ice. In addition the pressure patterns were so oriented that there was a tendency for the ice to drift shoreward and become entrapped in the fjords of Baffin Island and Labrador. Particularly noteworthy patterns of pressure appear in January and February of 1969. In January the normal northerly flow of air along the Labrador coast was replaced by a circulation from the northeast, and in February the normal northerly flow along the coast was replaced by a flow from the southeast. The effects of this was not only to directly oppose the southward drift of ice, but also to advect warmer than normal air in toward the Labrador coast, thus hastening the deterioration of icebergs.

The warm air also inhibited the formation and drift of sea ice. Sea ice serves to protect icebergs from the eroding action of the surrounding water, and to a certain extent, hinders the movement of the bergs. Thus the reduced amount of sea and ice had an adverse effect on the southerly movement of the bergs. The bergs, being relatively unhindered by sea ice and under the influence of the prevailing winds, drifted into shallow bays and inlets where they grounded. They were also subjected to accelerated erosion by the surrounding water. The strength of this warming effect is readily apparent in Figure 17 which shows normal and 1968–1969 frost degree days for selected stations along the Baffin Island, Labrador, and Newfoundland coasts.

Bi-monthly sea surface temperature charts for the 1969 ice season are shown in Figures 18 through 25.

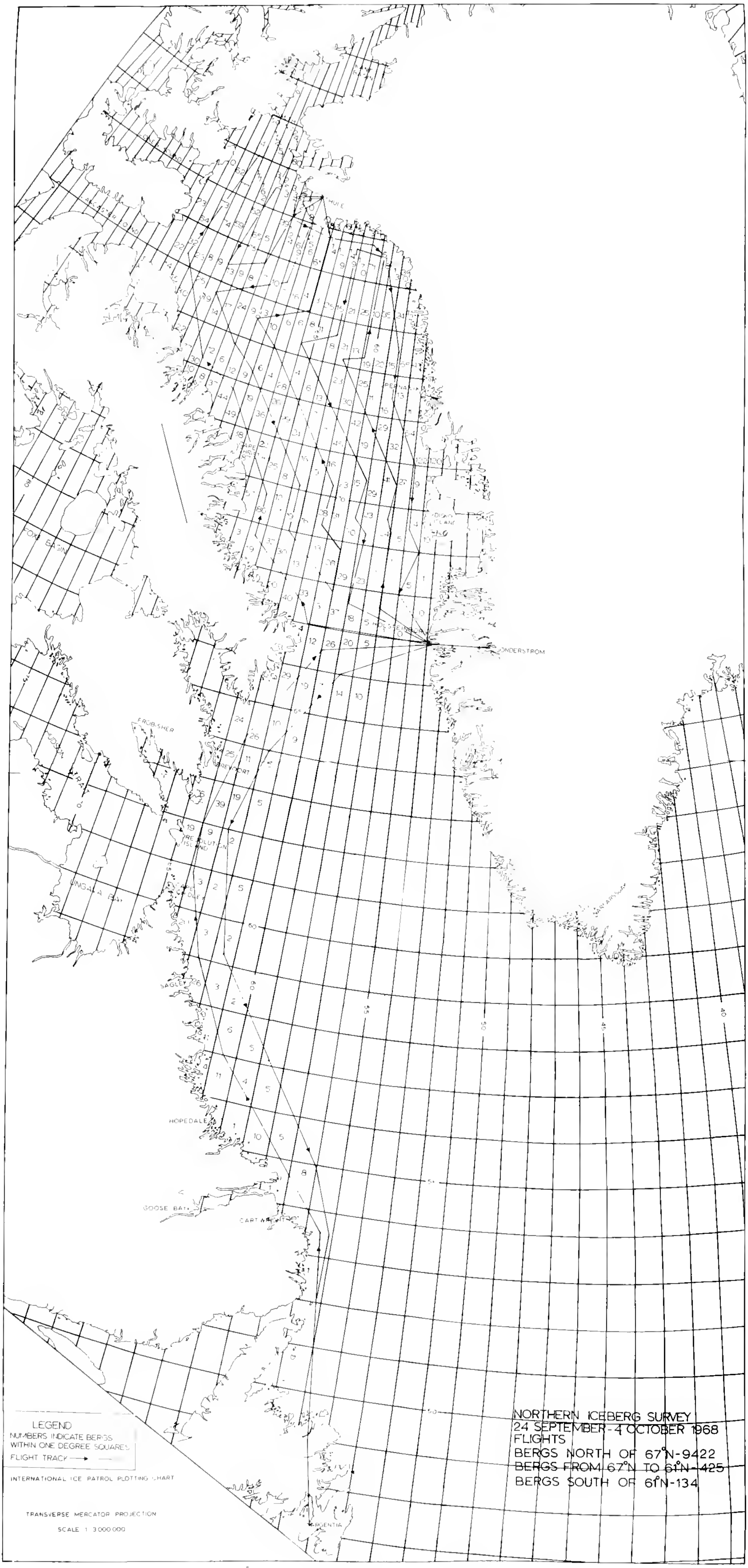

Figure 1—Ice Conditions, 24 September–4 October 1968.

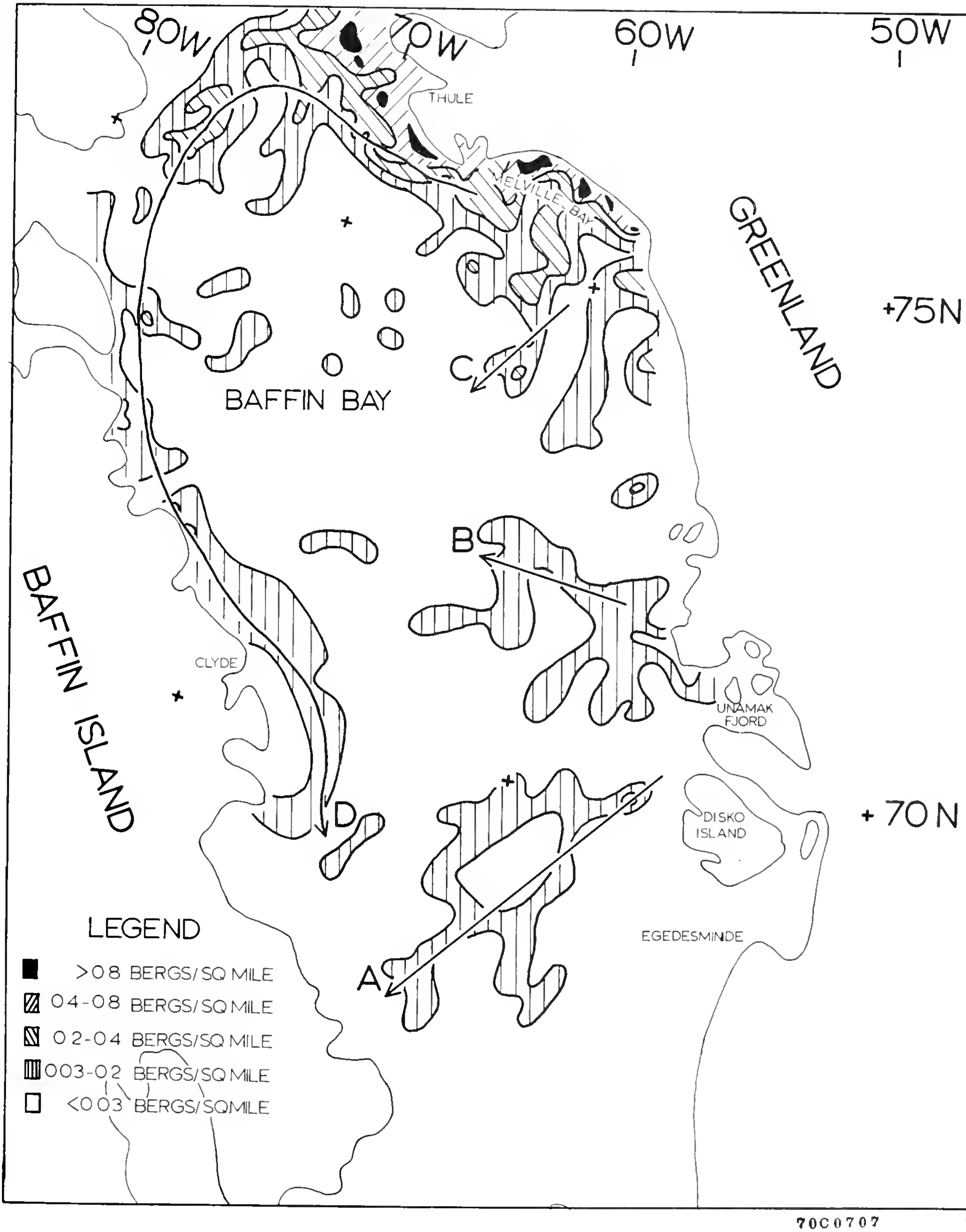

Figure 2—Smoothed Contours of Iceberg Density, September/October 1968.

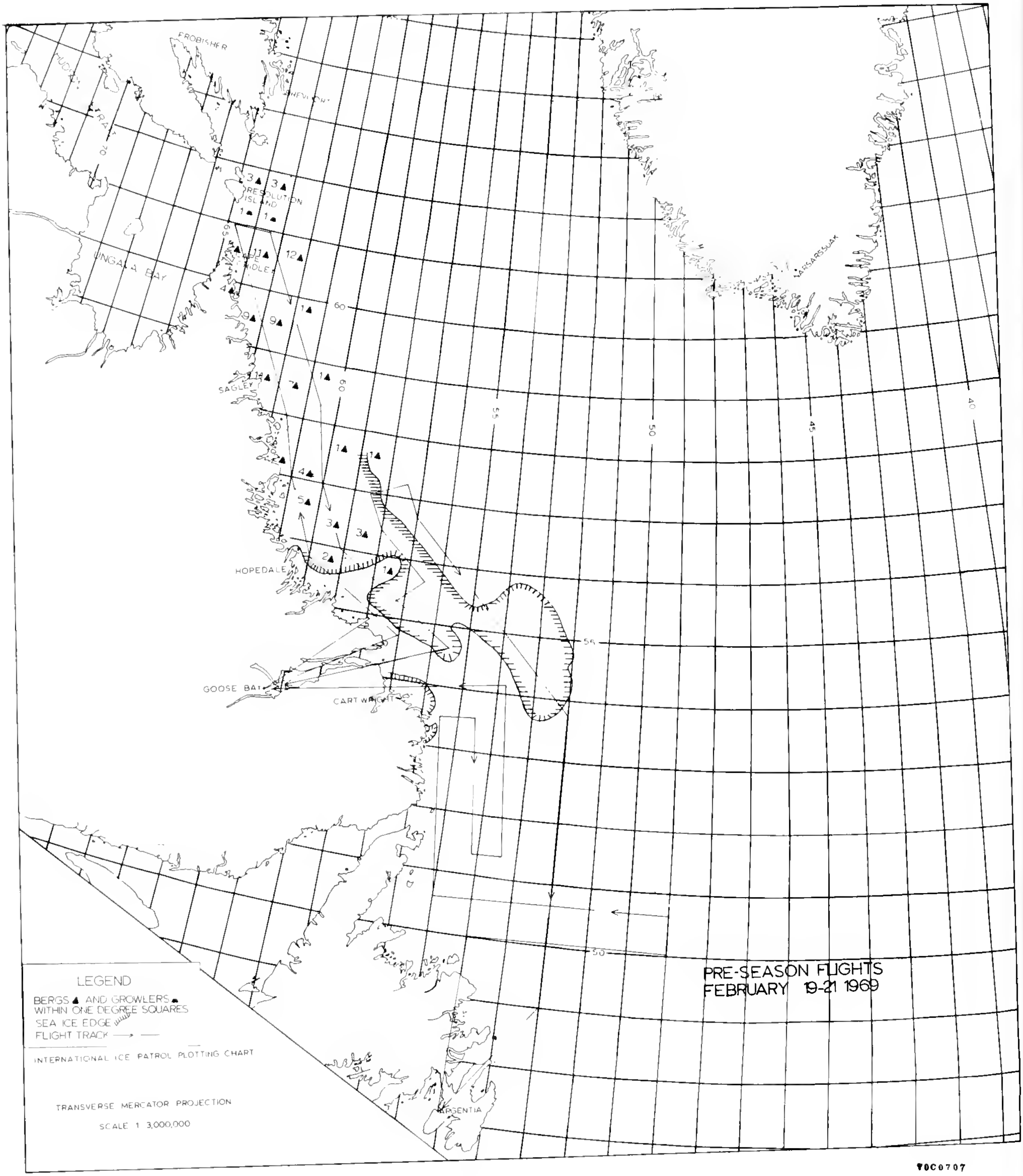

Figure 5—Ice Conditions, 19–21 February 1969.

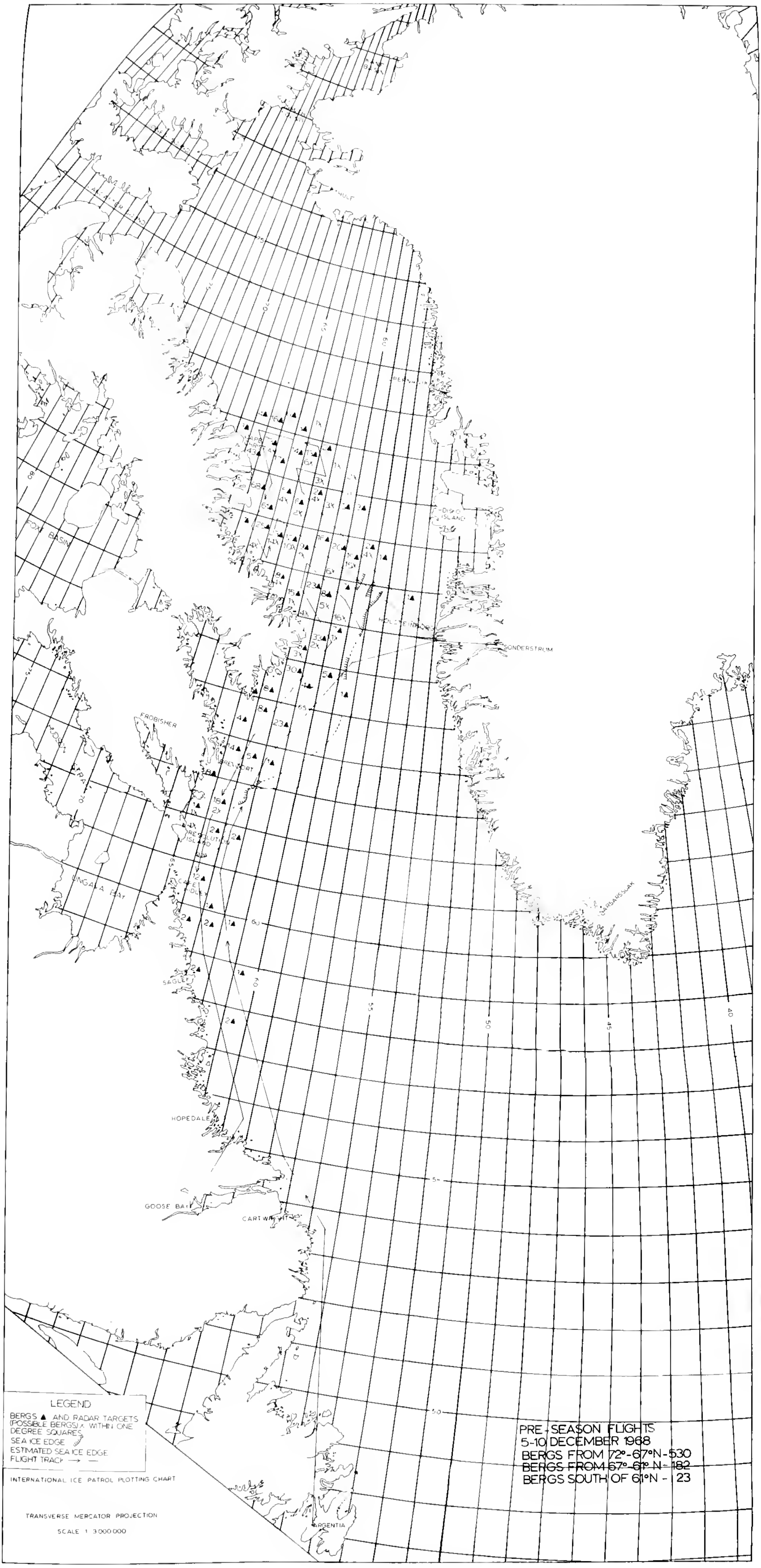

Figure 3—Ice Conditions, 5–10 December 1968.

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FL

INT

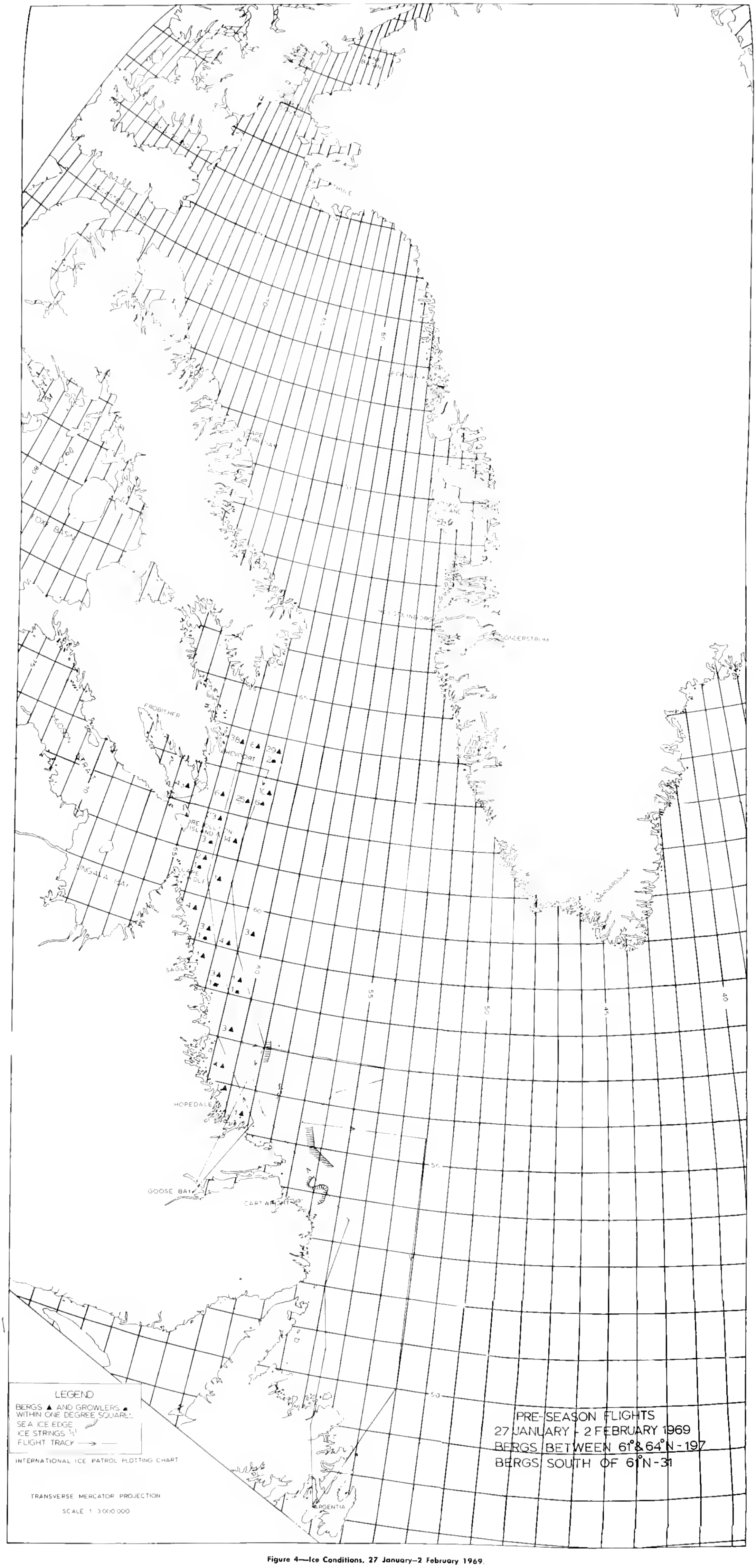

Figure 4—Ice Conditions, 27 January–2 February 1969.

B
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F

IN

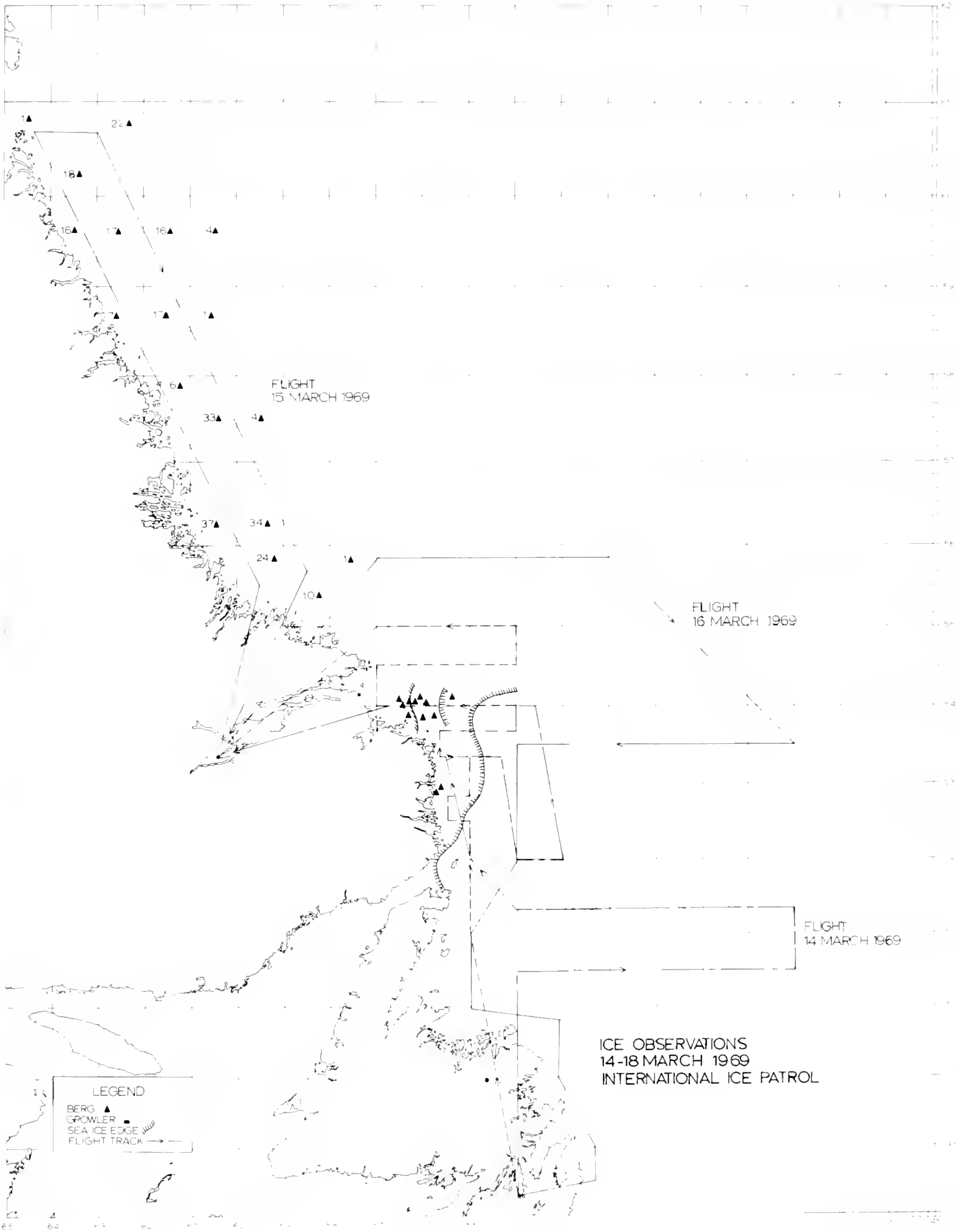

Figure 6—Ice Conditions, 14–18 March 1969. 70C0707

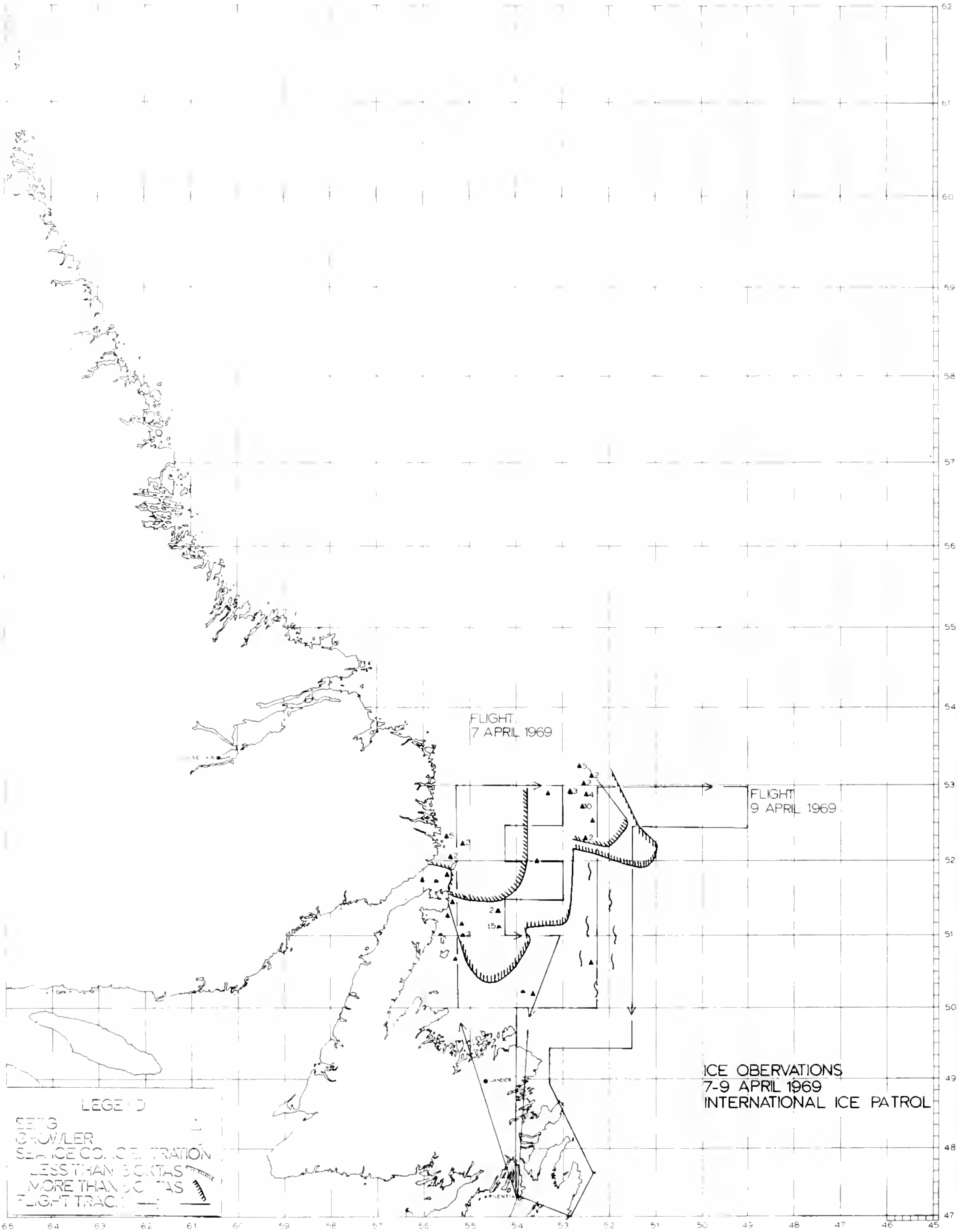

Figure 7—Ice Conditions, 7–9 April 1969.

70C0707

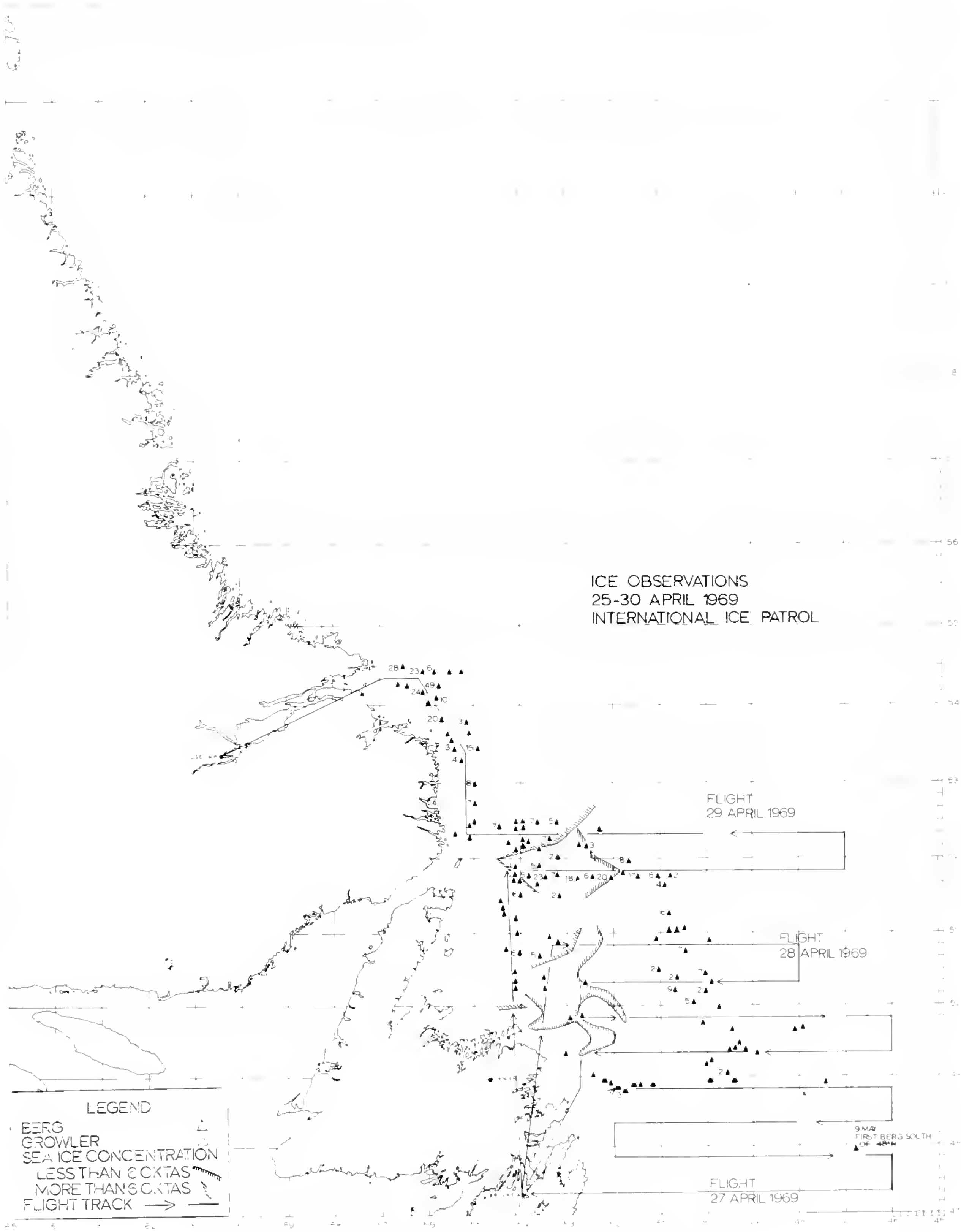

Figure 8—Ice Conditions, 25–30 April 1969; First Iceberg Reported South of 48° N.

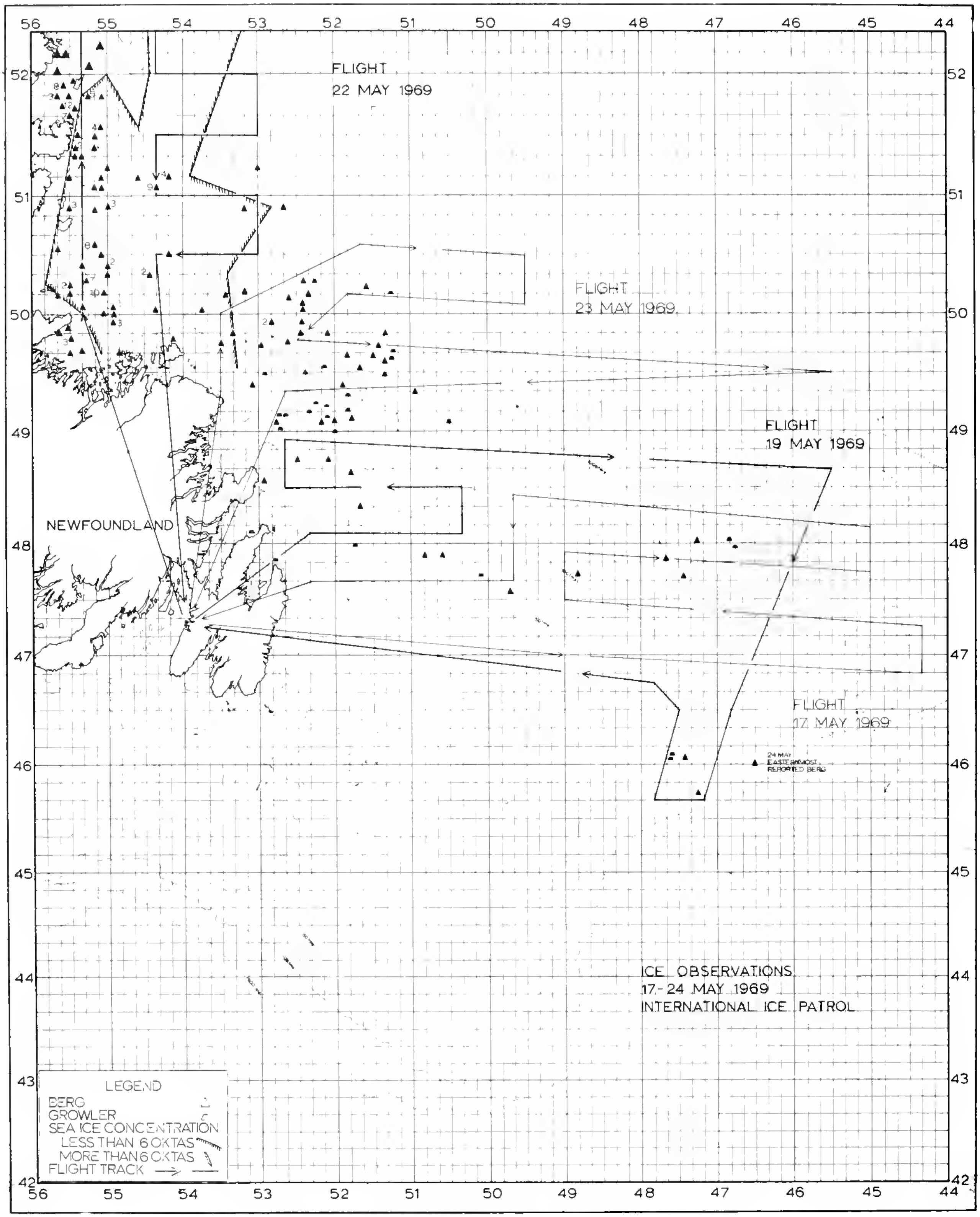

Figure 9—Ice Conditions, 17–24 May; Easternmost Reported Iceberg.

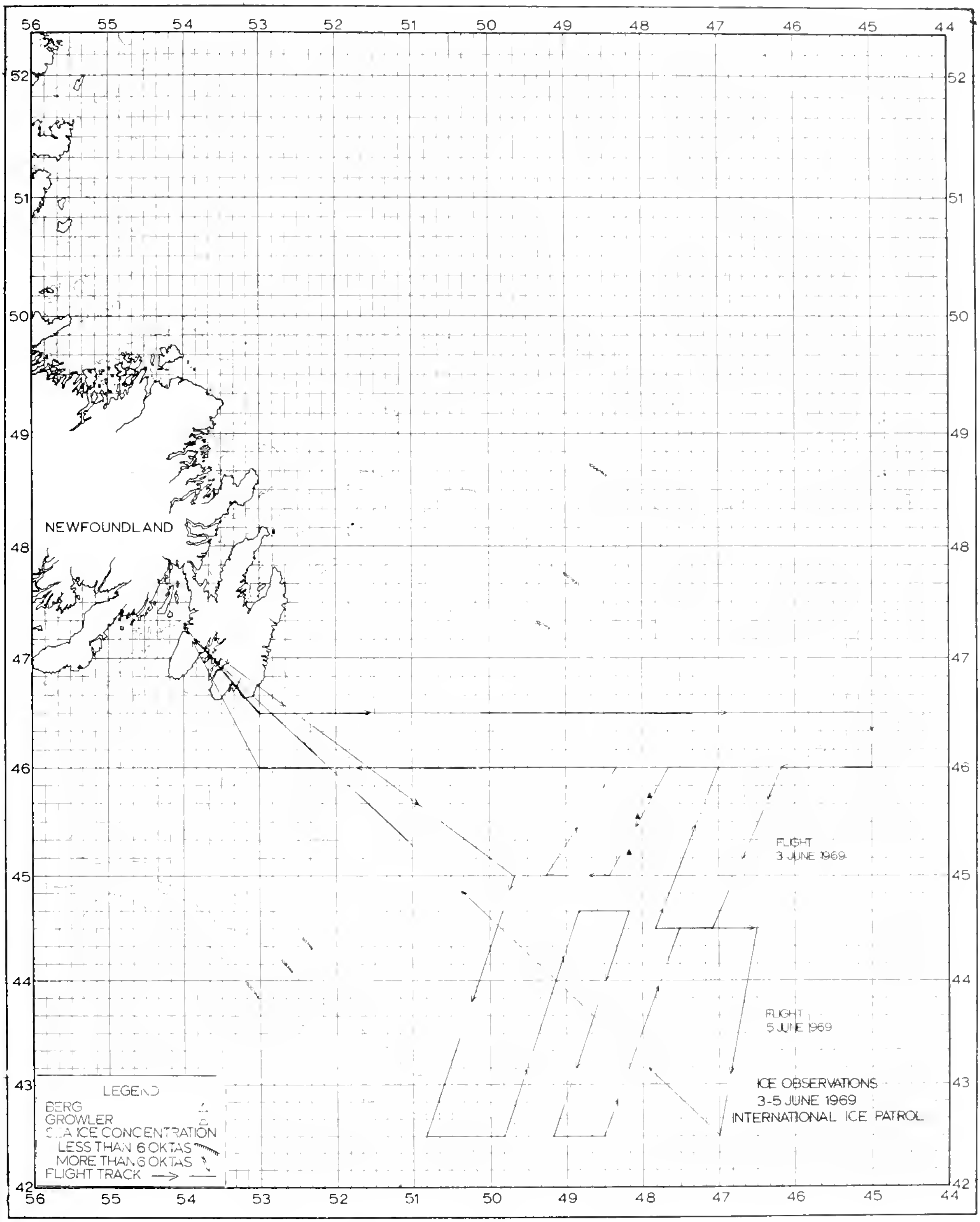

Figure 10—Ice Conditions, 3–5 June 1969.

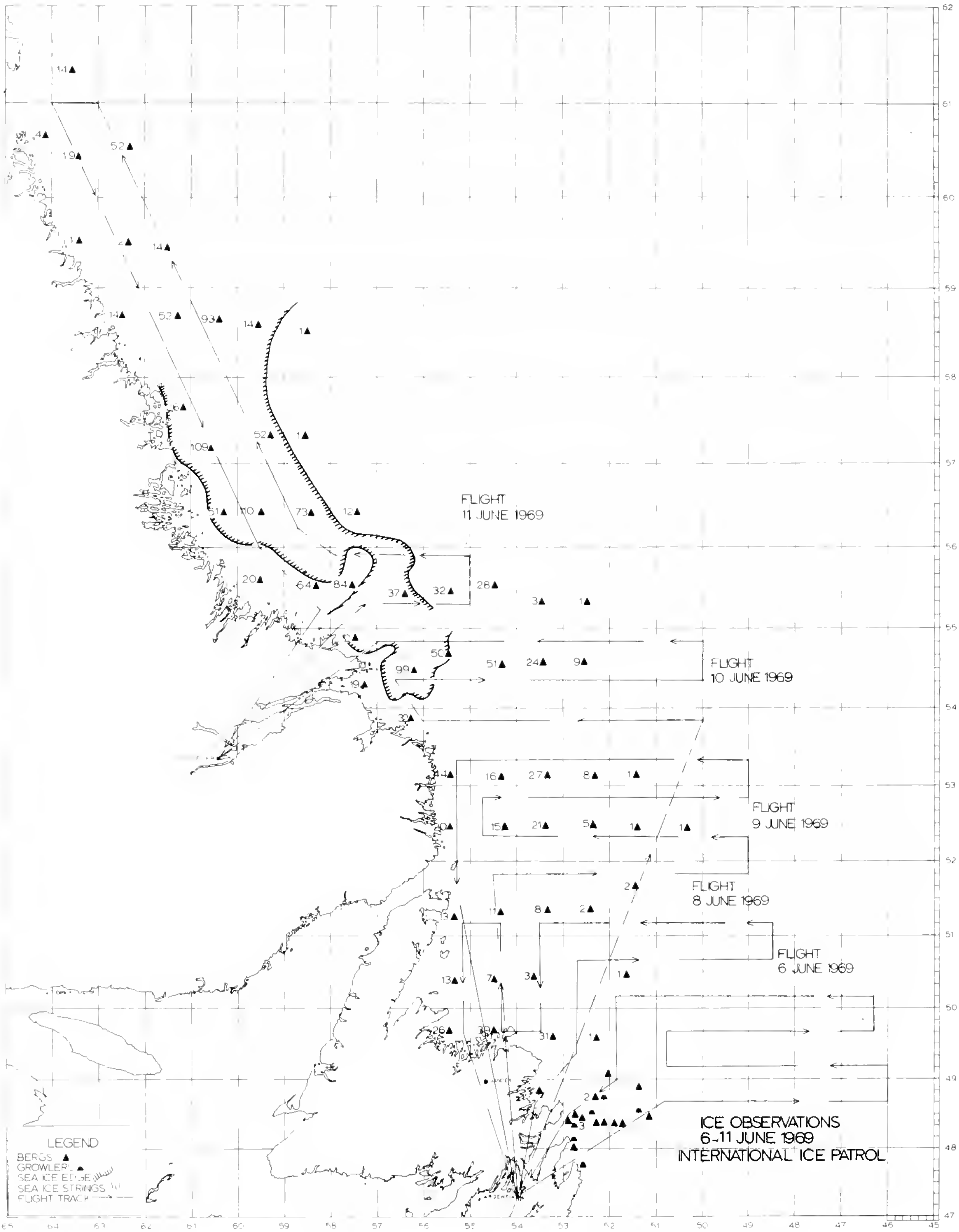

Figure 11—Ice Conditions, 6–11 June 1969.

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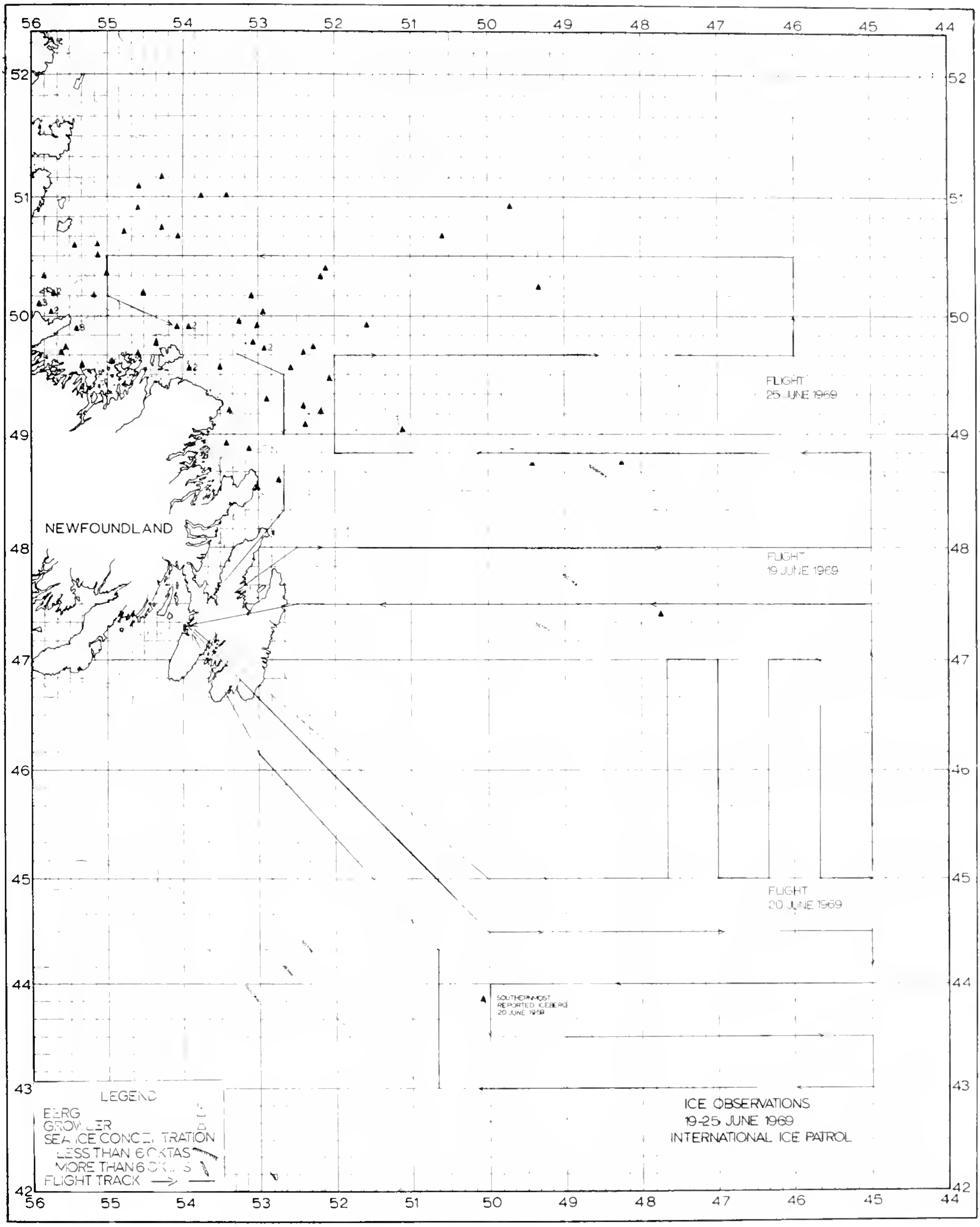

Figure 12—Ice Conditions, 19–25 June 1969; Southernmost Reported Iceberg.

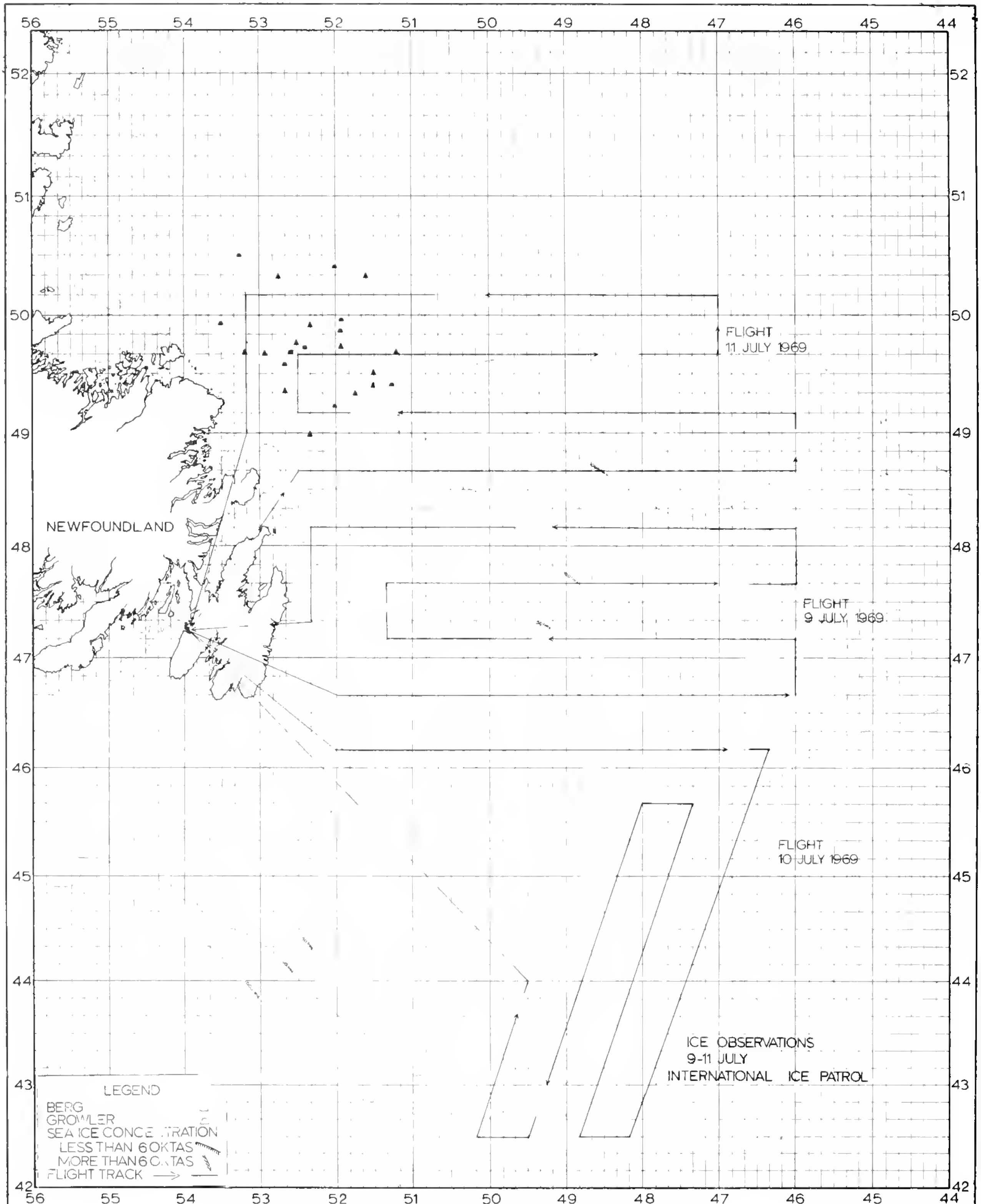

Figure 13—Ice Conditions, 9–11 July 1969.

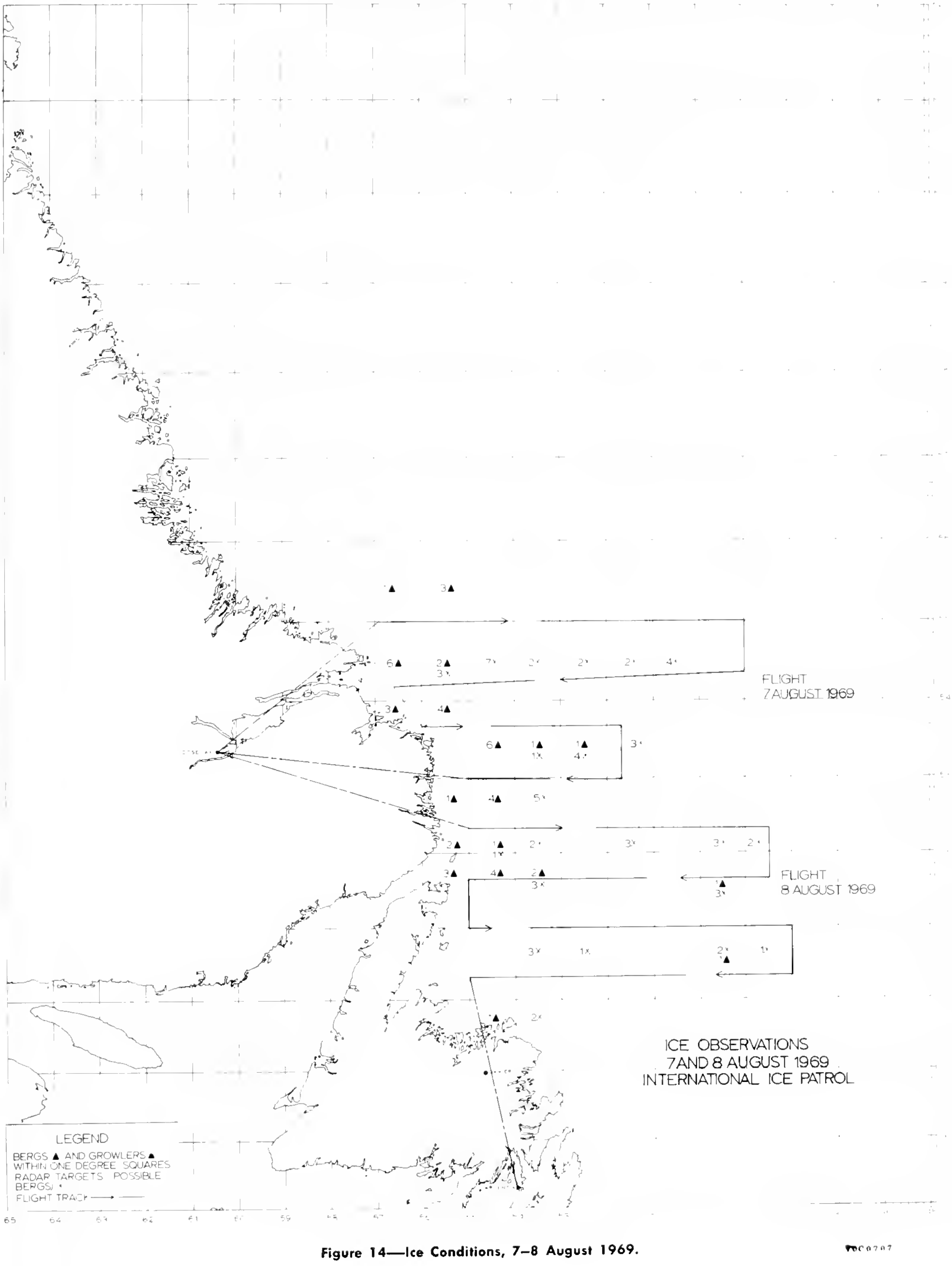

Figure 14—Ice Conditions, 7–8 August 1969.

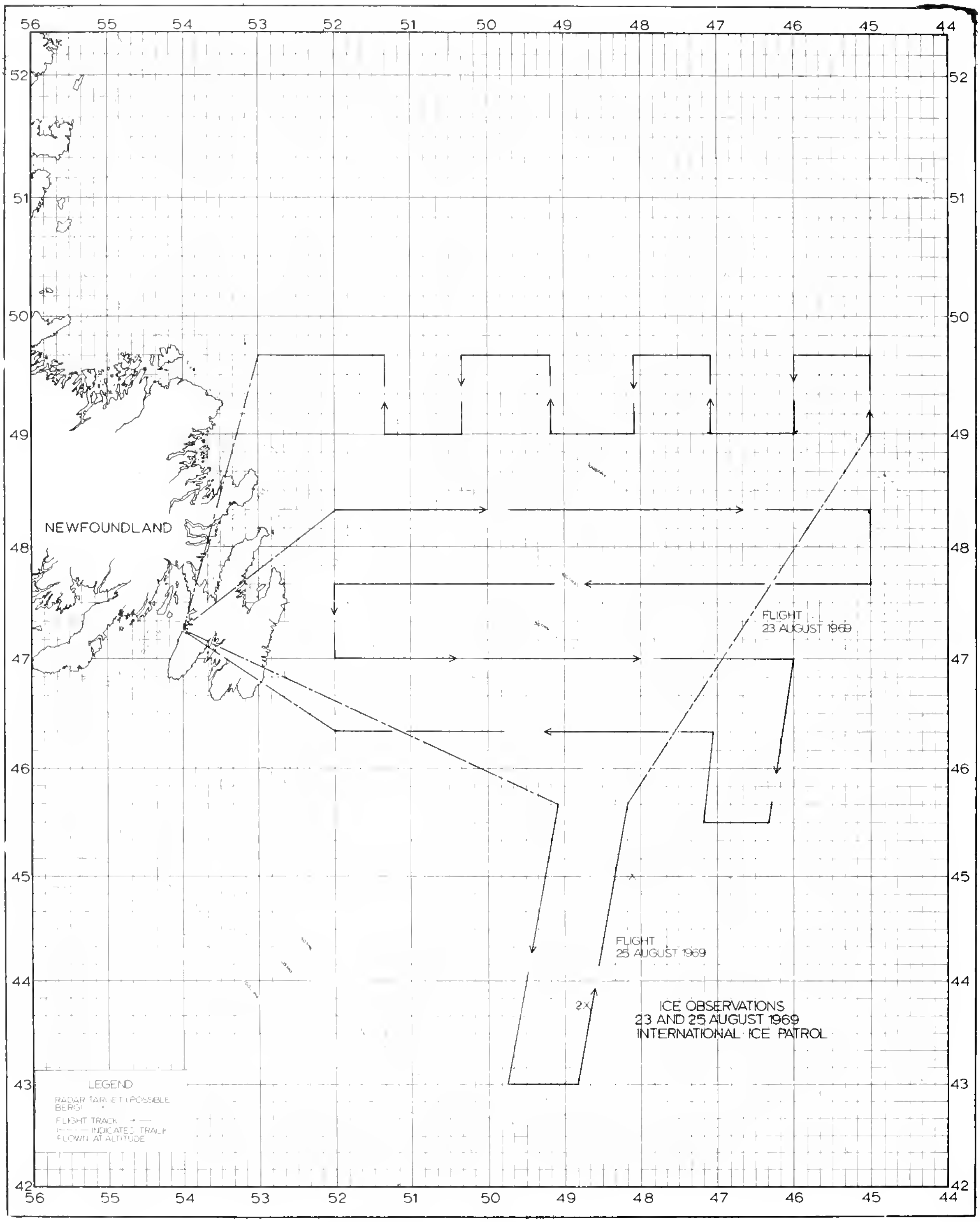

Figure 15—Ice Conditions, 23–25 August 1969.

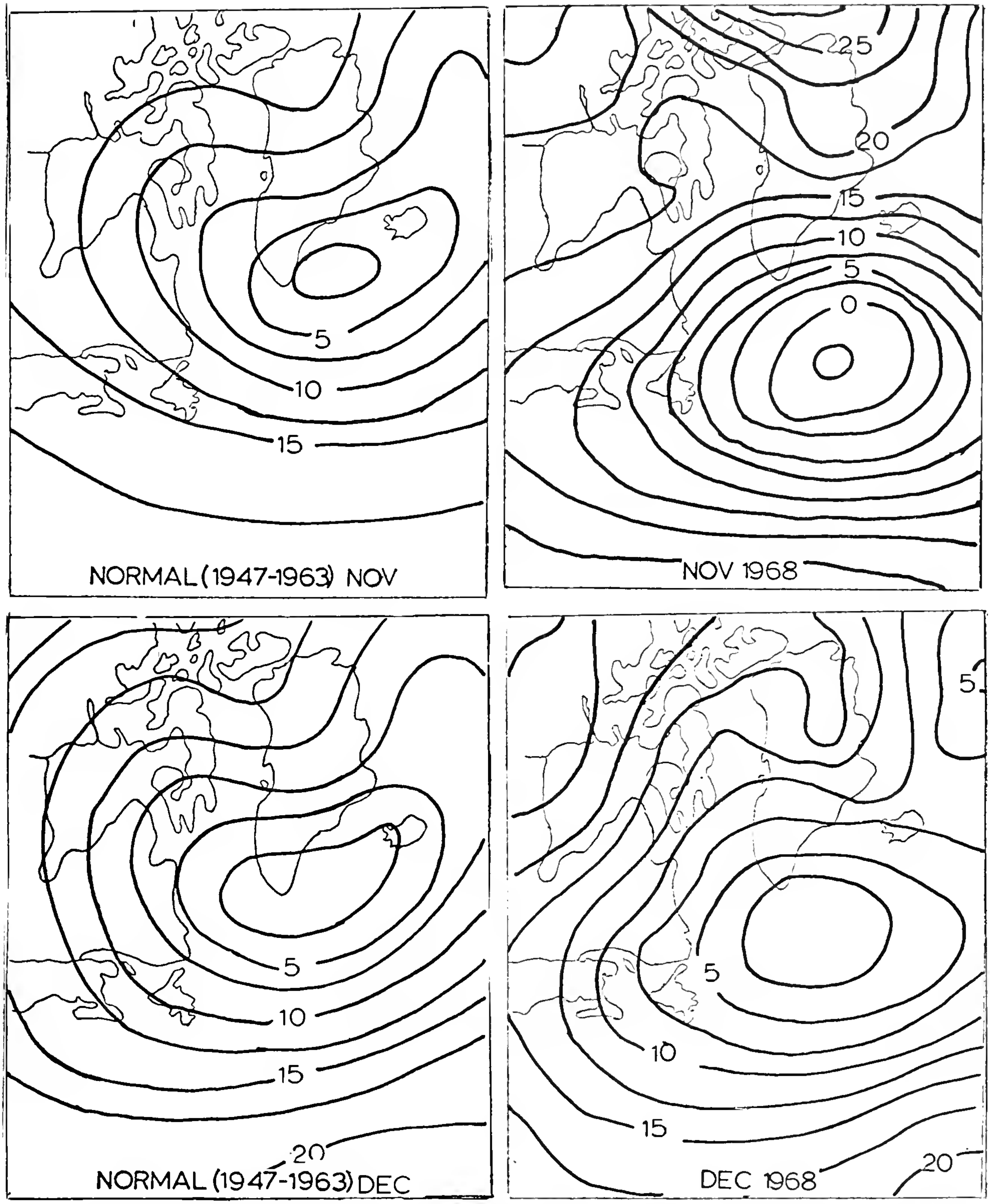

Figure 16A—November and December Normal and 1968 Monthly Average Surface Pressure in mbs relative to 1000 mbs. (Based on charts furnished by National Meteorological Center.)

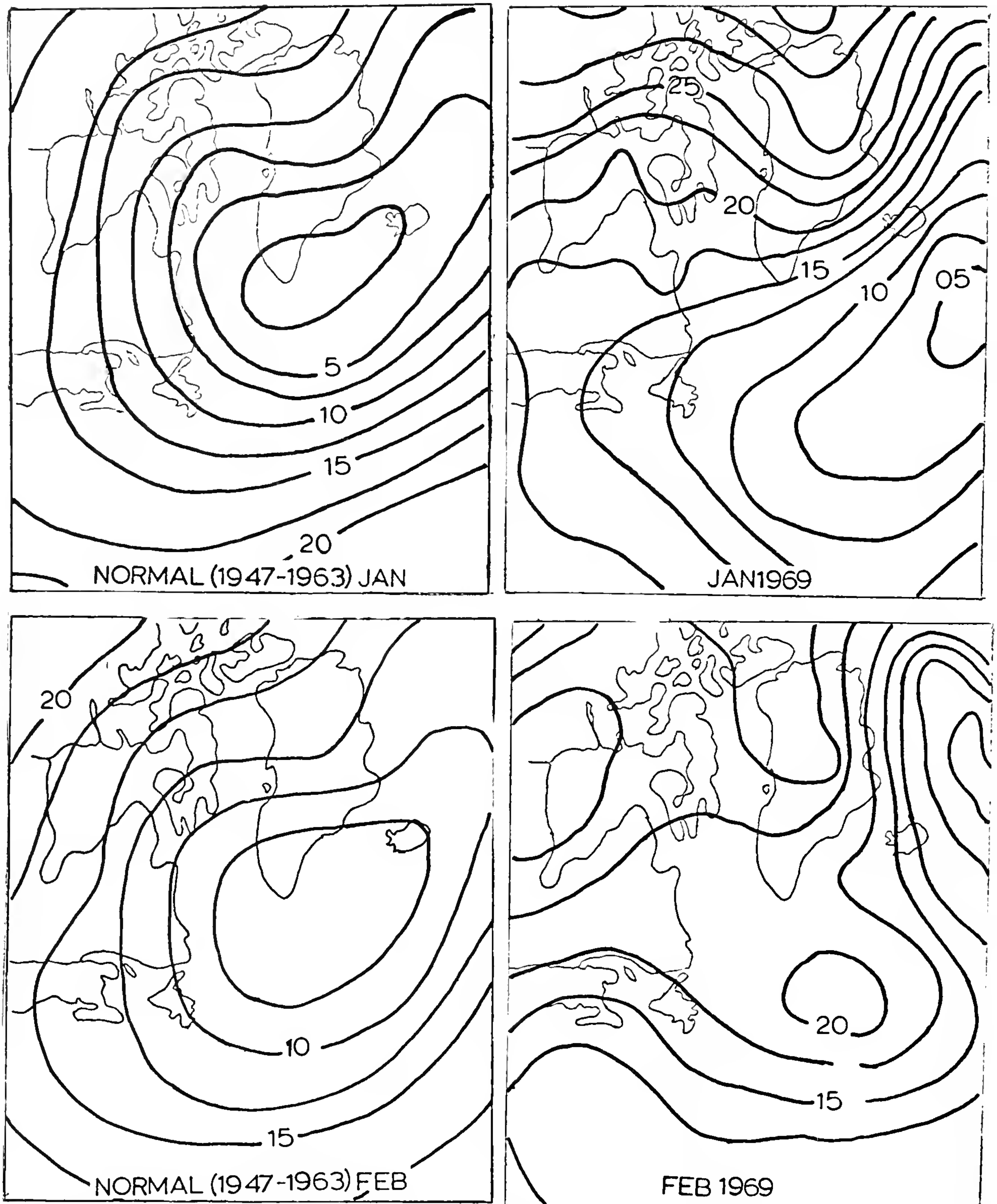

Figure 16B—January and February Normal And 1969 Monthly Average Surface Pressure in mbs relative to 1000 mbs. (Based on charts furnished by National Meteorological Center.)

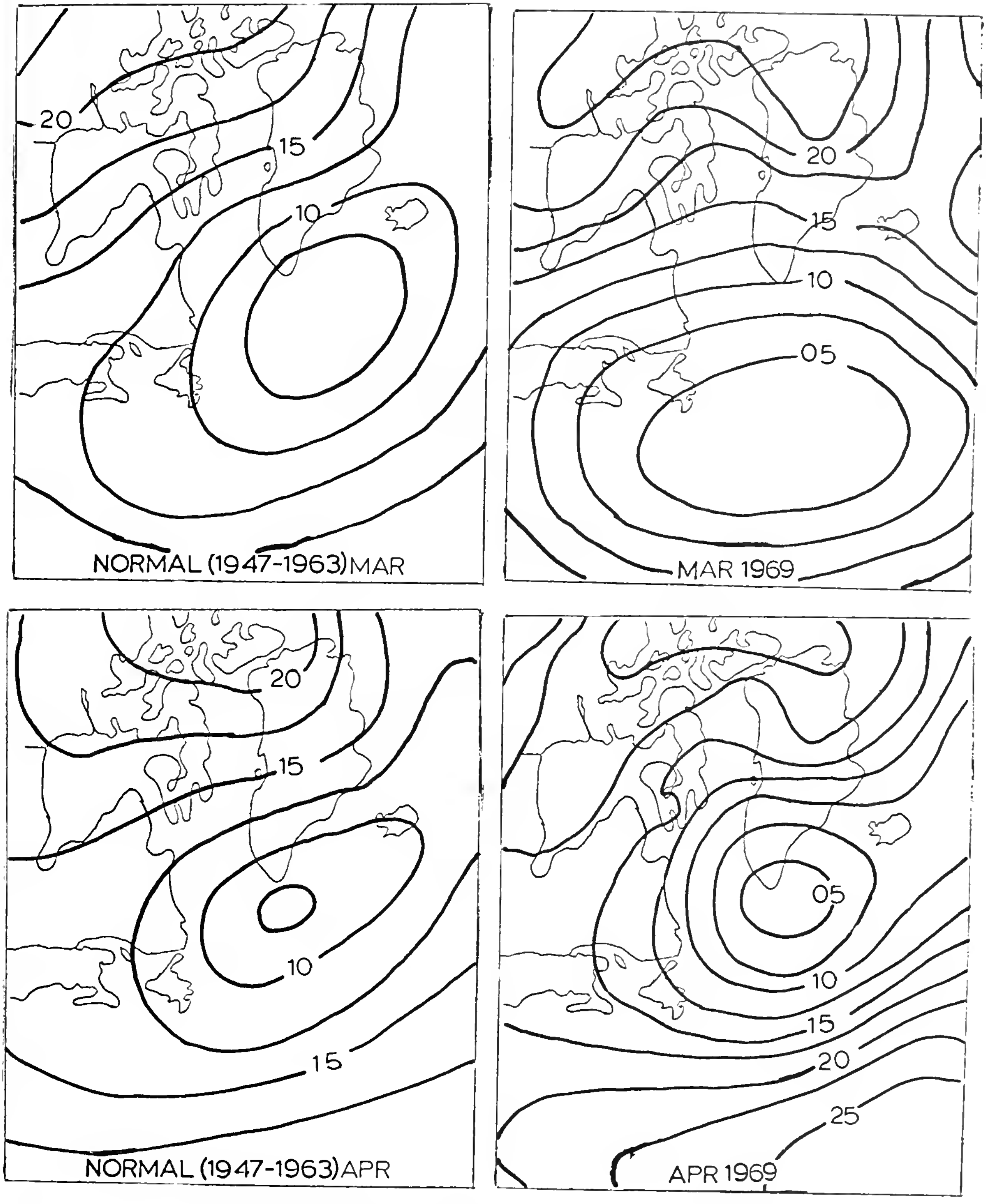

Figure 16C—March and April Normal And 1969 Monthly Average Surface Pressure in mbs relative to 1000 mbs. (Based on charts furnished by National Meteorological Center.)

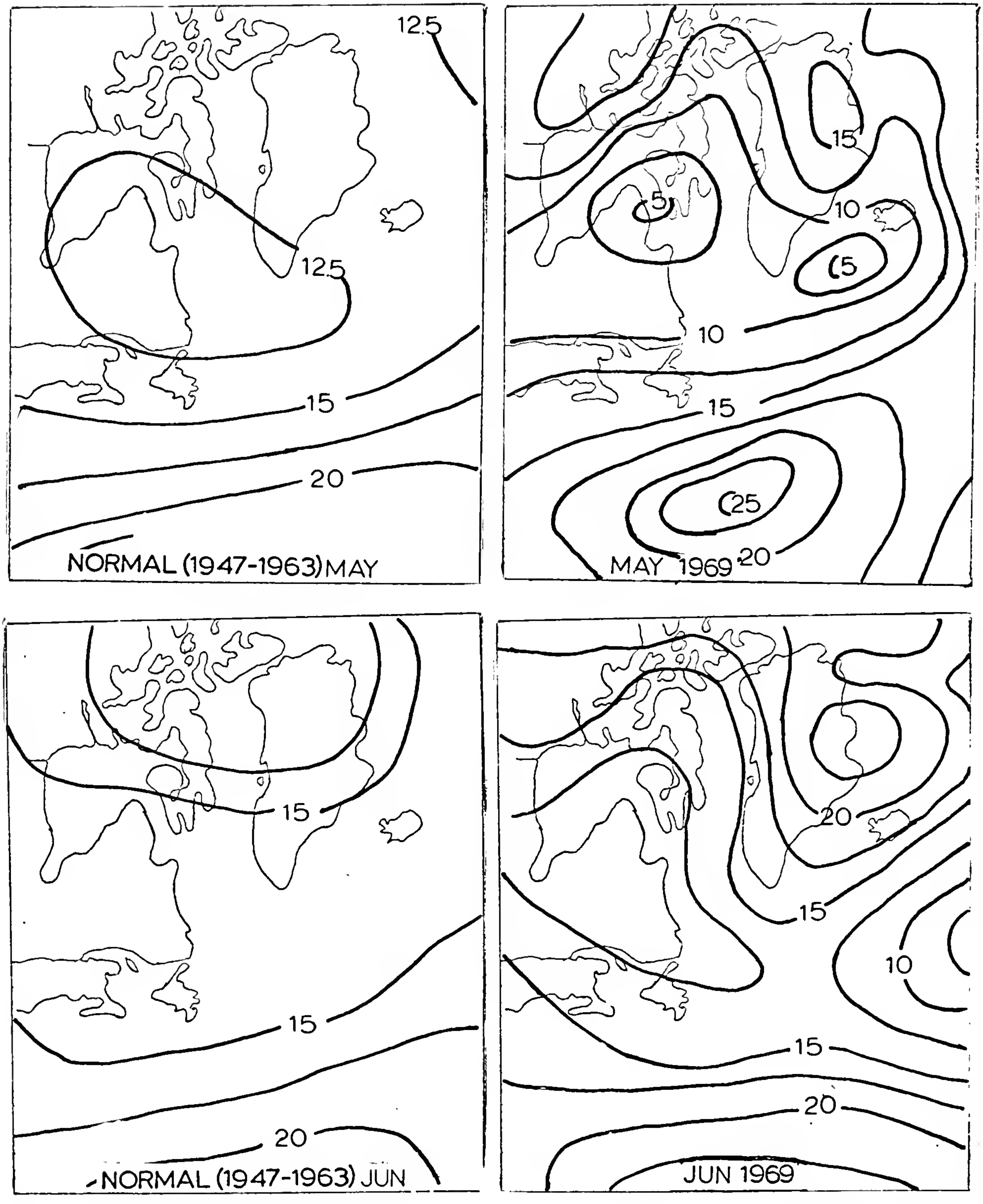

Figure 16D—May and June Normal and 1969 Monthly Average Surface Pressure in mbs relative to 1000 mbs. (Based on charts furnished by National Meteorological Center.)

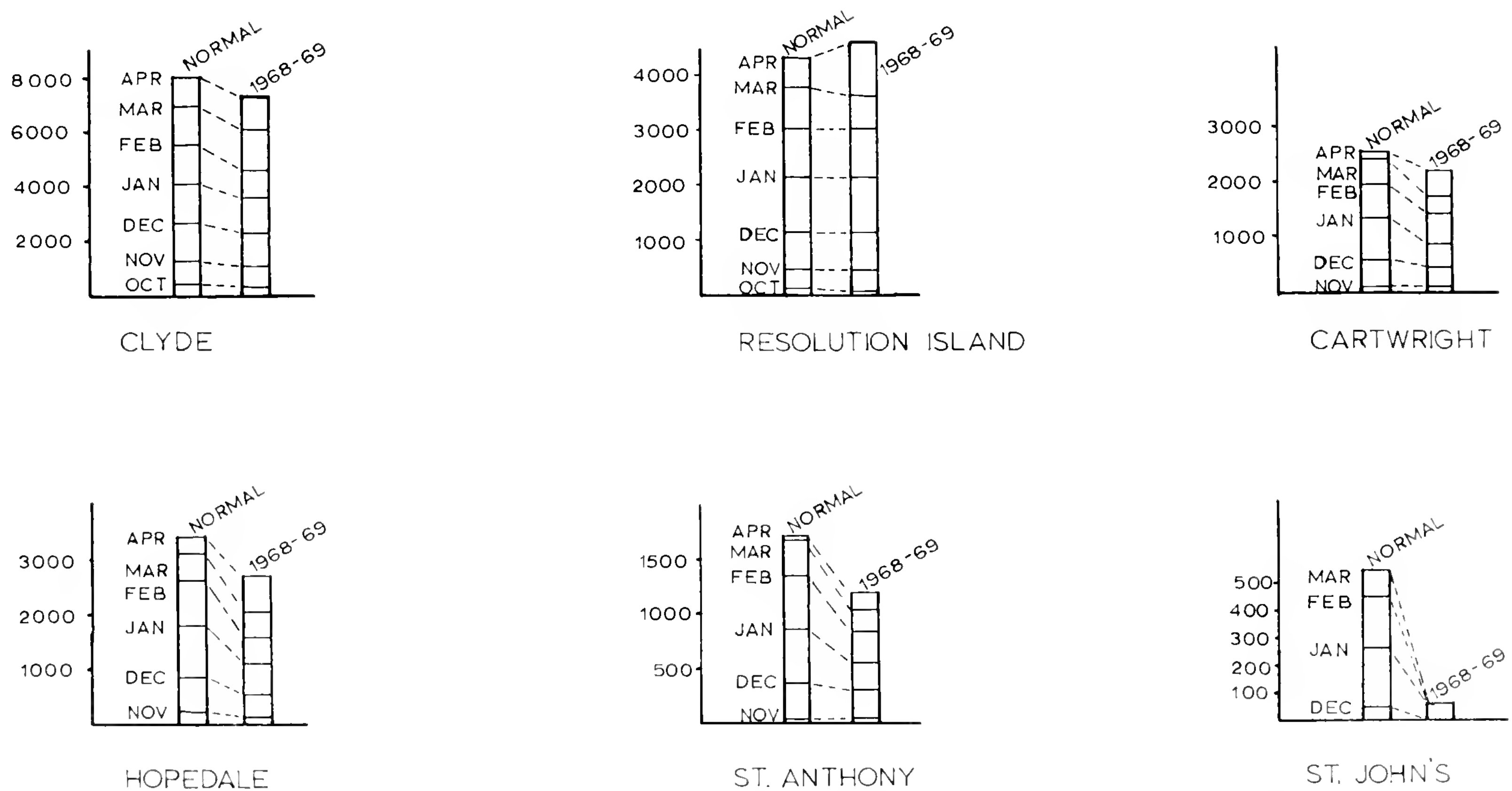

Figure 17—Mean Fahrenheit Frost Degree Days Calculated from Mean Monthly Temperatures. (Based on data furnished by Meteorological Branch, Canadian Department of Transport.)

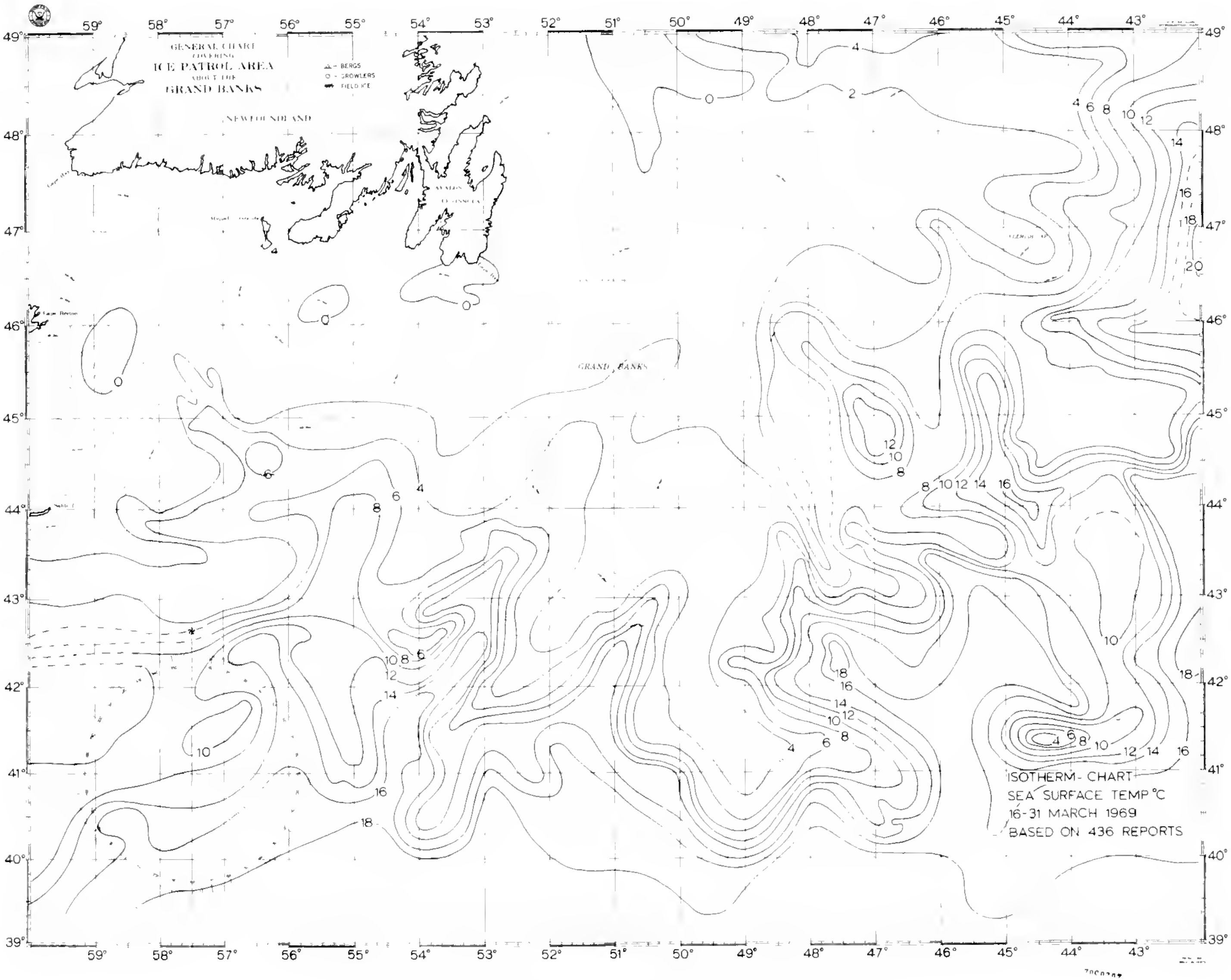

Figure 18—Sea Surface Temperature Isotherms, 16–31 March 1969.

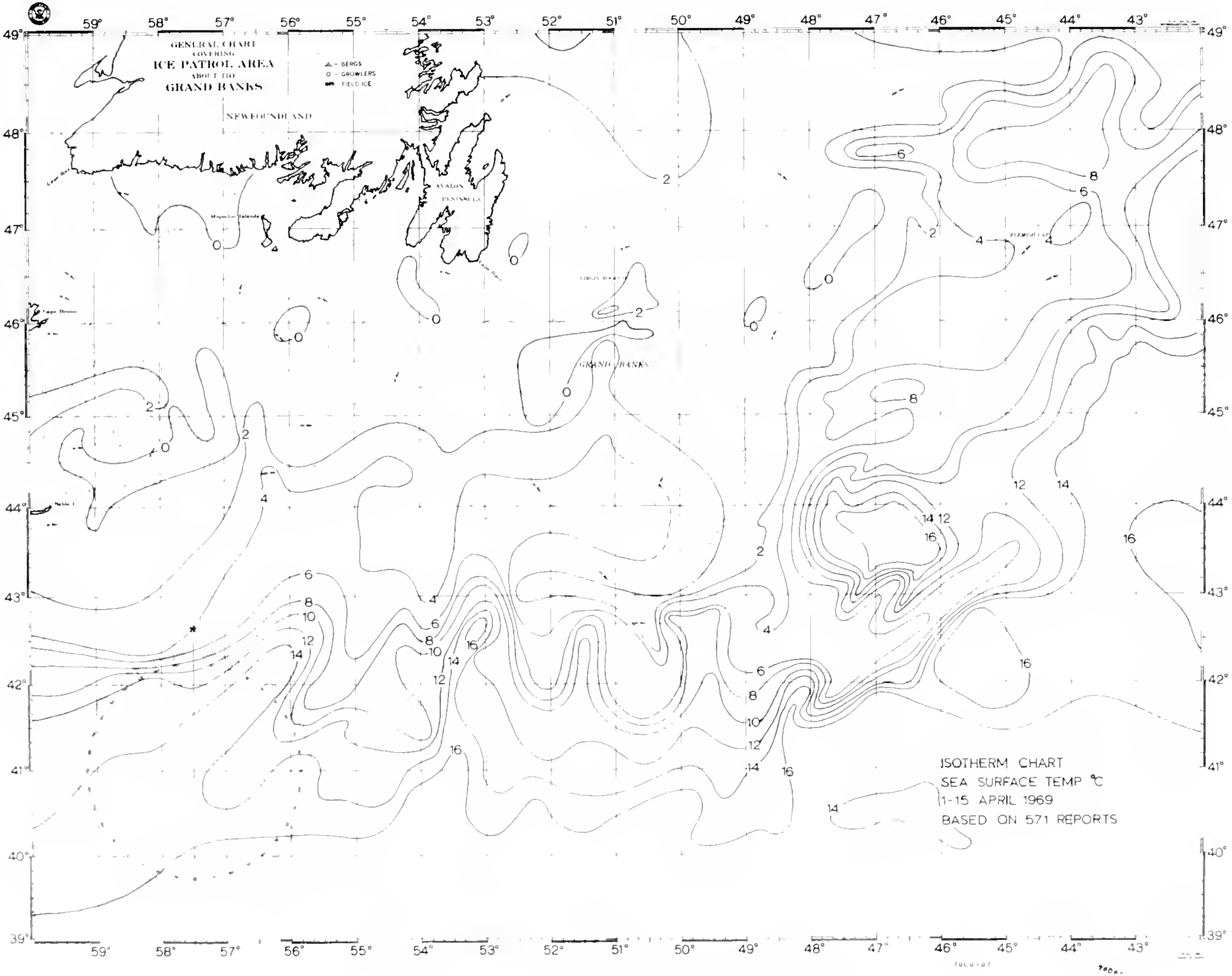

Figure 19—Sea Surface Temperature Isotherms, 1–15 April 1969.

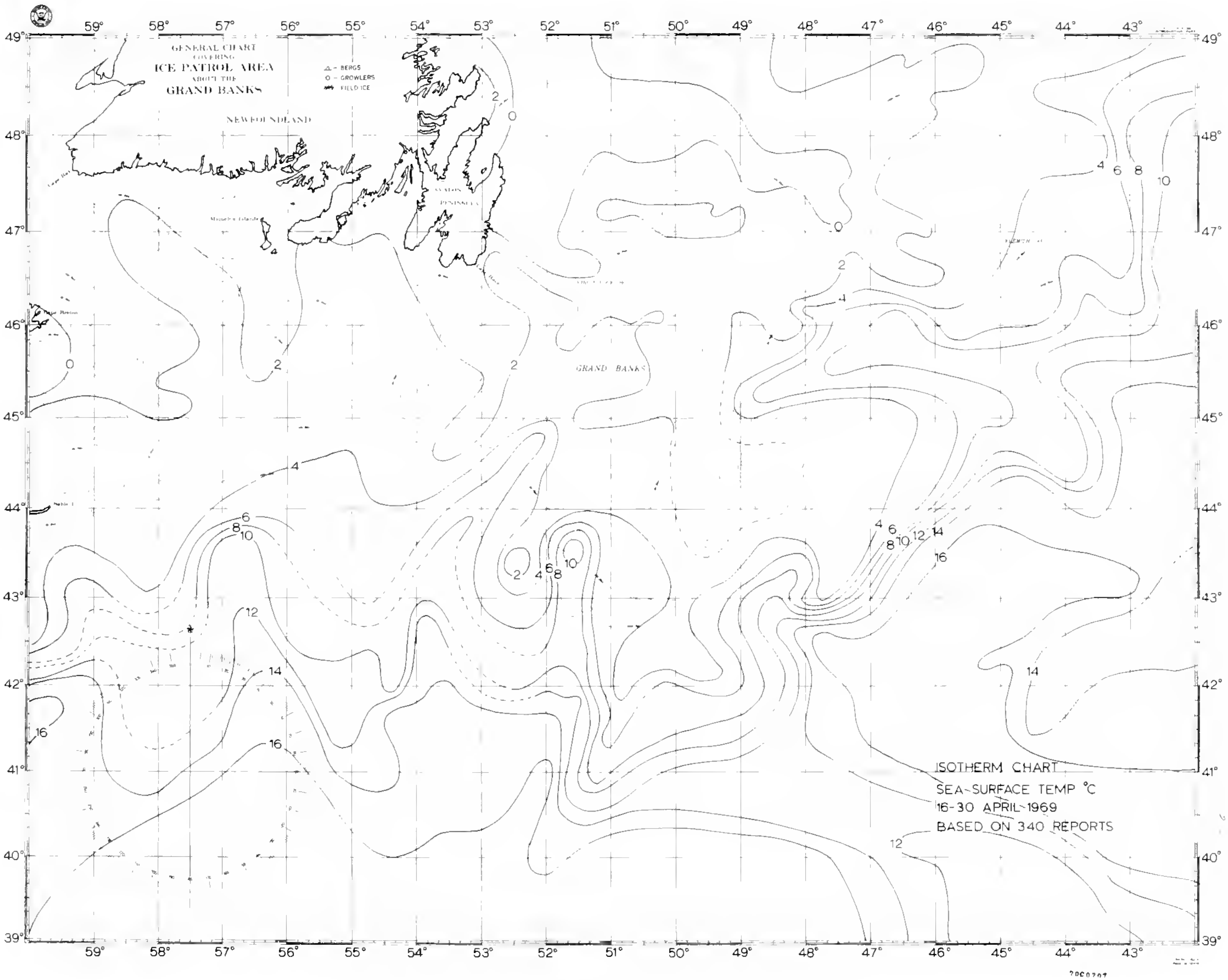

Figure 20—Sea Surface Temperature Isotherms, 16–30 April 1969.

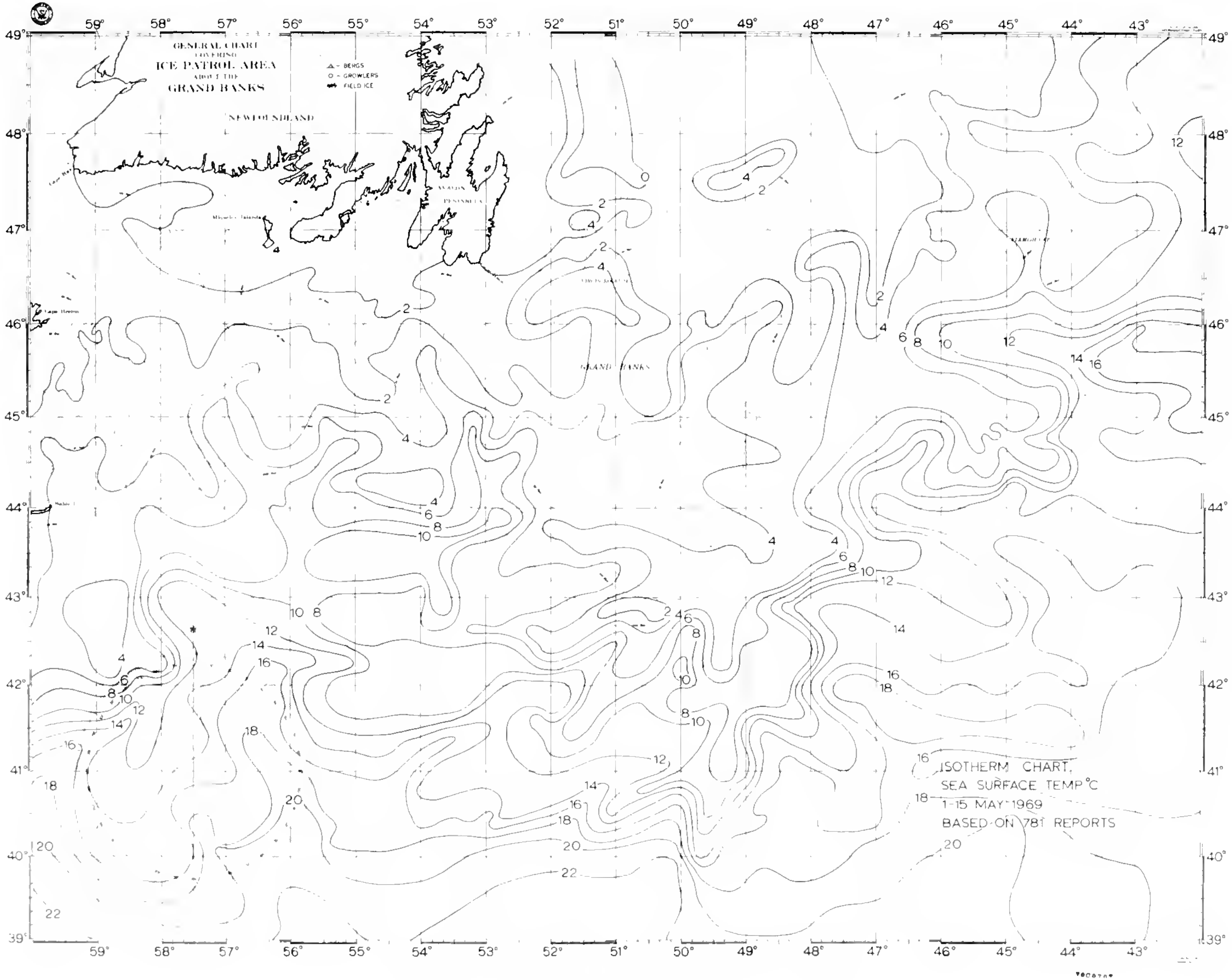

Figure 21—Sea Surface Temperature Isotherms, 1–15 May 1969.

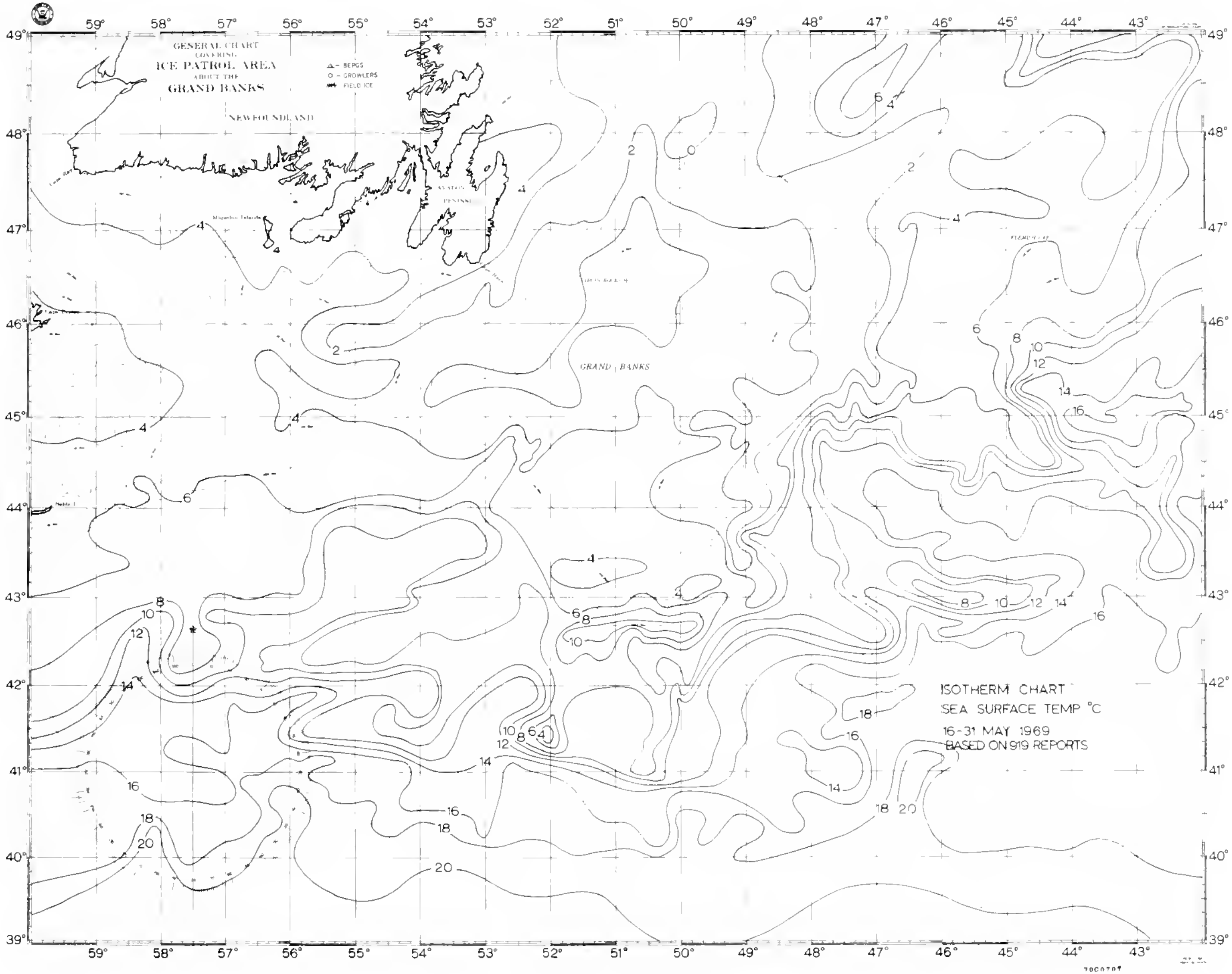

Figure 22—Sea Surface Temperature Isotherms, 16–31 May 1969.

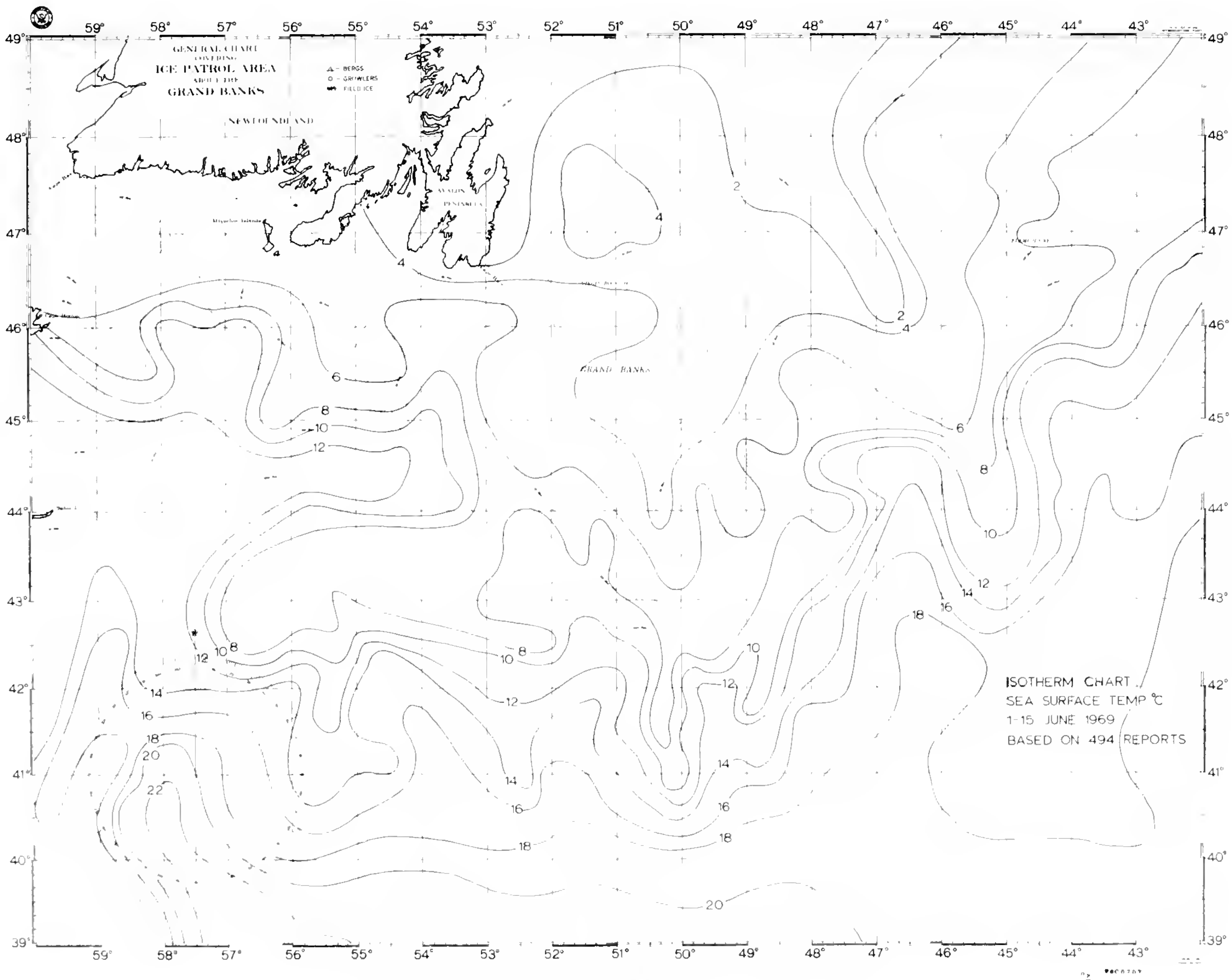

Figure 23—Sea Surface Temperature Isotherms, 1–15 June 1969.

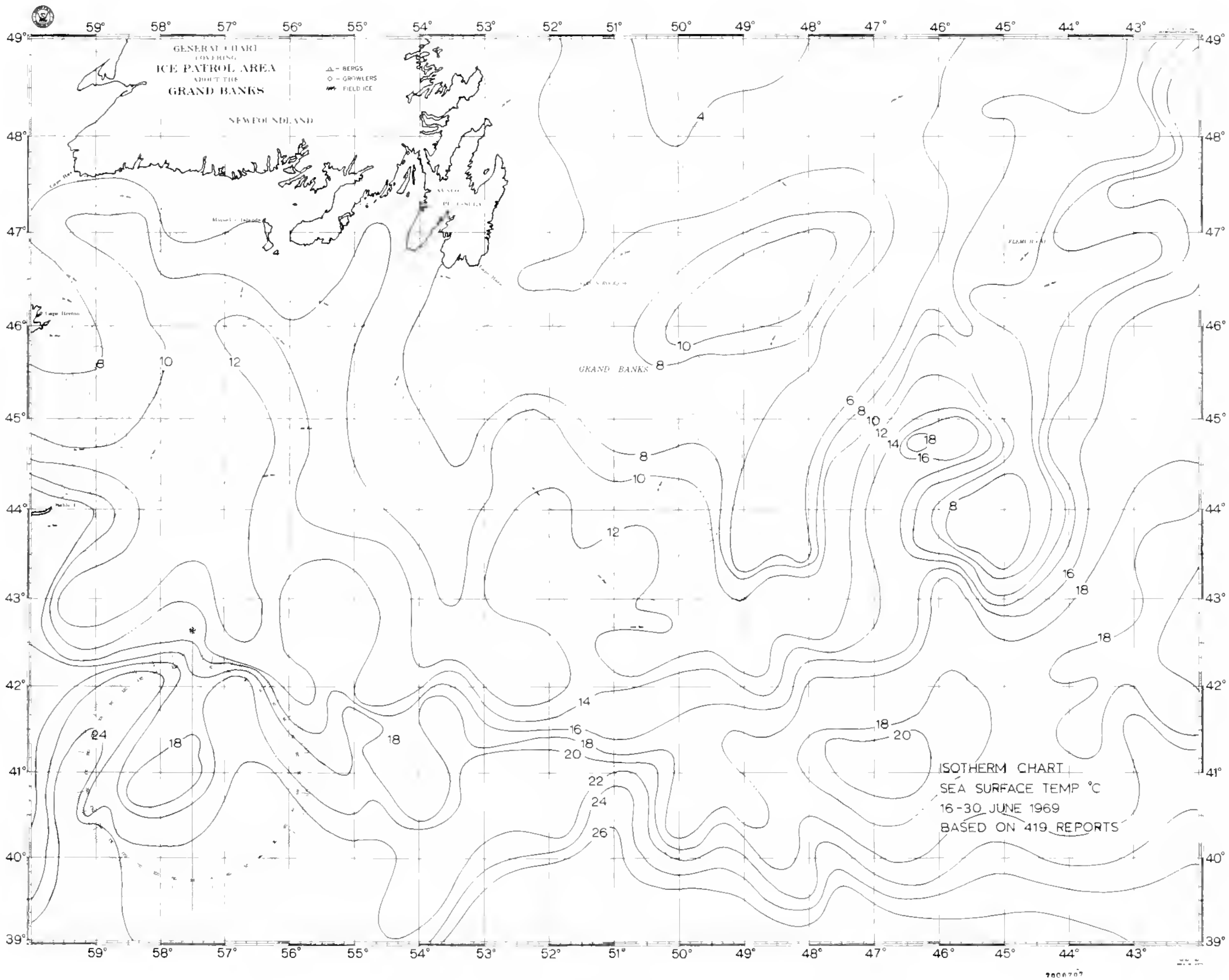

Figure 24—Sea Surface Temperature Isotherms, 16–30 June 1969.

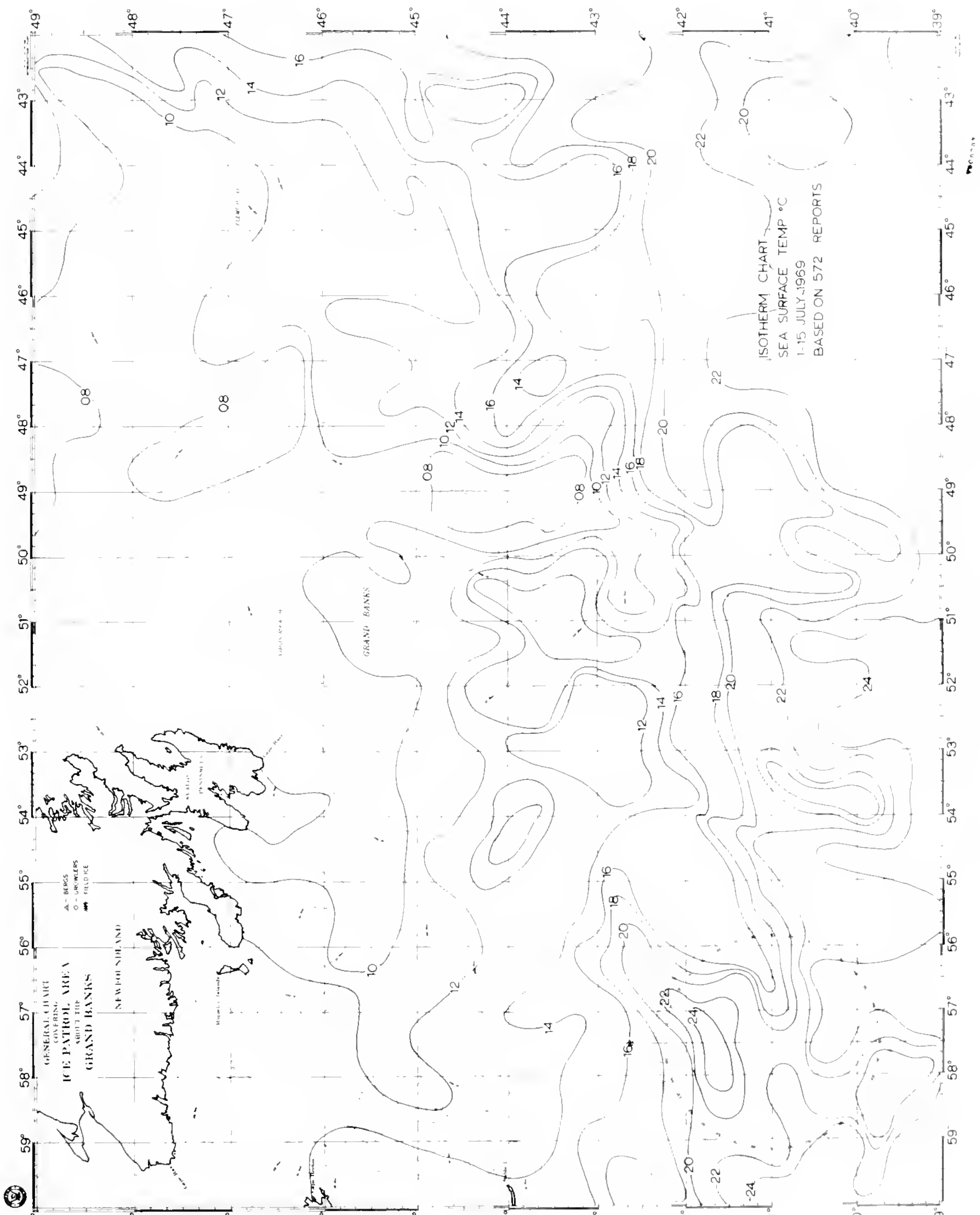

Figure 25—Sea Surface Temperature Isotherms, 1—15 July 1969.

U.S. GOVERNMENT PRINTING OFFICE: 1970 O—373-616

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